THE

MECHANICS' MAGAZINE.

JANUARY 5TH—JUNE 28TH, 1856.

EDITED BY R. A. BROOMAN.

VOL. LXIV.

"All the secrets feigned by poets to have been written in the books of enchanters, are worthless when compared with the mighty secrets which are really written in the book of nature, and which, with time and patience, will be read there." MACAULAY.

LONDON:
ROBERTSON, BROOMAN, AND CO.
Mechanics' Magazine Office,
166, FLEET-STREET.
AGENTS:—*EDINBURGH*, J. SUTHERLAND; *GLASGOW*, W. R. M'PHUN, AND DAVID ROBERTSON; *DUBLIN*, HODGES AND SMITH, 104, GRAFTON-STREET; *PARIS*, A. & W. GALIGNANI, RUE VIVIENNE; *HAMBURGH*, W. CAMPBELL.

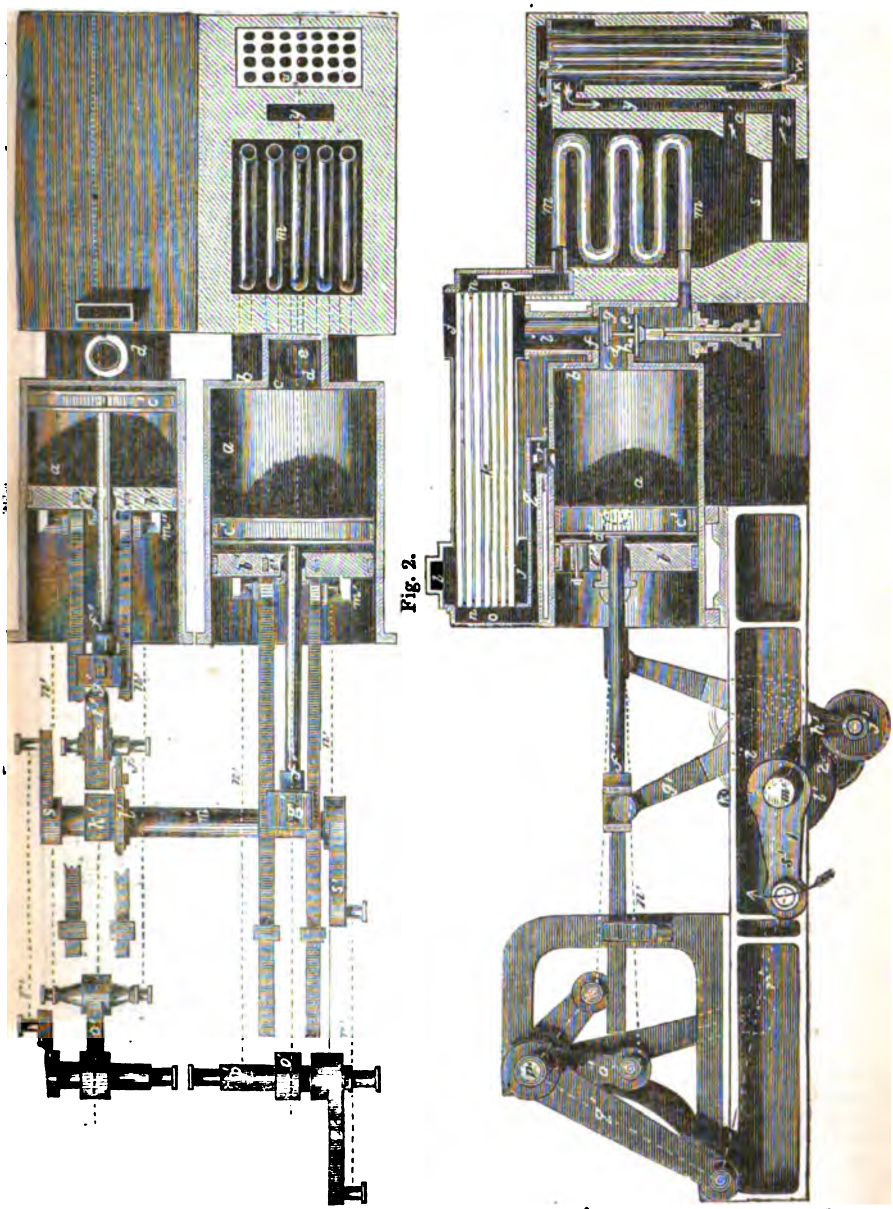
1856.

Mechanics' Magazine.

No. 1691.] SATURDAY, JANUARY 5, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

CAPTAIN ERICSSON'S NEW AIR-ENGINE.



CAPTAIN ERICSSON'S NEW AIR-ENGINE.

(Patent dated May 8, 1855.)

CAPTAIN ERICSSON has recently patented a new air-engine, in which the application of caloric is identical with that in the original engine patented by him in 1833; but in the new engine the heated air, after having performed its office in the working cylinder, is made to circulate through a vessel containing a series of tubes, precisely as in the former engine, and the current of heated air in passing through this vessel (called the regenerator) is met by a current of cold air, circulating in an opposite direction through the series of tubes on its way to the working cylinder, by which a transfer of caloric is effected between the two currents of air passing off from and entering the working cylinder; and the current of cold air on its way to the working cylinder, after having been thus partially heated by the described process of transferring the caloric, is afterwards made to pass through a series of tubes or other vessels exposed to the fire of a furnace, also in the same manner as in the former engine.

But although the means for heating and for transferring the caloric from the escaping to the entering air is similar to that patented by Captain Ericsson, in 1833, the mechanism or engine which forms the subject of the present patent, and is intended to render the heating of the air subservient in producing motive power, differs altogether from anything heretofore known.

Before describing the invention, however, it may be proper first to notice, in order that its nature may be correctly understood, that in all air-engines working on what is called the differential principle, (such as the air-engine patented by Captain Ericsson in 1850,) the motive energy depends solely on the difference of areas of the working and supply pistons. "Experience has" says the patentee, "in the meantime demonstrated, that in order to obtain a sufficient supply of air, without resorting to a dangerously high temperature, the supply-pump must be of such large capacity that the differential active area becomes too small. Unless, therefore, future experience should suggest some improvement, the power of such engines will always be found insufficient for practical purposes."

The principal feature of the present invention consists in charging the regenerator and heater, or either, with fresh compressed atmospheric air at each stroke of the engine, without the employment of a supply pump, by the peculiar combined movements of two pistons within the working cylinder, the introduction of fresh air and its transfer to the regenerator or heater in a compressed state being effected under an equilibrium of pressure, so that the supply piston becomes entirely relieved from resistance during the process of charging the regenerator or heater, whilst at the same time one of these pistons performs the office of working piston, exerting full force on the engine without suffering retardation by any unbalanced pressure against the supply piston.

Fig. 1 is a plan of the improved engine with the two cylinders, the pistons, and the air-heating apparatus in section; and fig. 2 is a side elevation, with one of the cylinders, the piston, and the air-heating apparatus in section, to exhibit the internal arrangement. The engines are single acting, and two are connected by a crank shaft, the two cranks being placed at an angle of 180°, so that, while the piston of one engine is being impelled by the tension of heated air, the piston of the other is making its return stroke, and *vice versâ*; and as the two engines are identical in construction, the description of one of them will answer for the two. The manner of connecting the two, and the effects resulting therefrom, will be subsequently described. The following description is by Captain Ericsson's agent.

"The cylinder, *a*, is open at one end, and has a head, *b*, at the other, with a central aperture, *c*, leading to a valve-chest, *d*, with an induction port, *e*, and an exhaust-port, *f*, fitted with valves, *g*. The stem of the valve, *g*, passes through the hollow stem of the valve, *h*, and these valves are to be operated by any known and suitable valve-gear giving the periods of movements, such as will be presently described. The exhaust-port leads by a pipe, *i*, to a chamber, *j*, surrounding a series of small tubes, *k*, constituting what has been termed the regenerator, so that the air passing from the cylinder to the escape-pipe, *l*, shall circulate around and among the series of tubes, to impart its heat to the cold supply air contained within the tubes; and the induction-port communicates with the tubes, *m*, of what is termed the heater. The series of tubes, *k*, constituting the regenerator, are suitably secured to a tube-sheet, *n*, at each end, and open into two chambers, *o* and *p*; the one, *o*, communicating by a pipe, *q*, with a port in the side of the cylinder, governed by a self-acting valve, *r*, opening outward, and the other, *p*, communicating with the heater tubes, *m*, which are to be suitably coiled or otherwise arranged to present a large extent of surface to the action of the heat evolved from the fire of a furnace, *s*, the series of tubes, *m*, being placed above the fire, so that the products of combustion in passing to the flue, *t*, shall circulate around

and among them. The bottom plate of the flue, t, is a tube sheet, to which are secured a series of flue tubes, u, down which the products of combustion pass to a flue, w, below, leading to the chimney.

"The flue tubes, u, are enclosed in a chamber, having an aperture, v, near the bottom to receive a current of air from the atmosphere, and another aperture, x, near the top, through which the current of air passes after circulating round and among the flue tubes, by which it is heated, so that the products of combustion escape into the atmosphere at a very low temperature; for it will be observed that the two currents travel in opposite directions, the atmospheric current passing from the coldest towards the hottest ends of the flue tubes, gradually absorbing the heat from the products of combustion which are passing through the tubes in the opposite direction.

"From the passage, x, the partially-heated air passes down a vertical flue or tube, y, having two apertures, z and a', both governed by dampers or registers, one leading below the grate in the furnace to supply the fire when more heat is required, and the other above the fire, to admit the air directly to the heater tubes, m, when it becomes necessary to moderate the heat of the tubes. By this arrangement a great saving of fuel is effected, and the attendant can control and regulate the heat of the heater tubes with perfect ease. To the cylinder are fitted two pistons, b' and c'. The one, b', is nearest the open end of the cylinder, and called the working piston, and is provided with a self-acting valve, d', opening inwards, and the other, c', termed the supply piston, is placed between the working piston and the head of the cylinder.

"The rod, f', of the supply piston passes through a stuffing-box, e, in the working piston. This piston rod embraces the end of an arm, g', that vibrates on a fulcrum-pin, h', and the arm carries two rollers, i' and j', one on each side of the fulcrum-pin, h', which rollers, for the purpose of governing the motions of the supply piston, are alternately acted upon by two cams, k' and l', on the crank-shaft, m', the cam, k', acting on the roller, i', and the other, l', on the roller, j'. In figure 1, the arm and the two cams are concealed on one of the engines, but represented on the other, and in fig. 2, the arm and its rollers are represented in the two opposite extreme positions. The cam, k', operates on the roller, i', to carry the supply piston inwards towards the head of the cylinder, and the other cam, l', controls or governs its motion in the opposite direction when impelled during a part of its movement by the heated air. The working piston is provided with two wrist pins, m'' m'', one on each side of the stuffing-box, e', which are taken hold of by two connecting-rods, n' n', connected with a vibrating arm, o' on a rock-shaft, p', which is provided with another arm, q', at the angle indicated on the drawing, and the arm, q', is in turn connected by a rod, r', with the crank, s', on the crank-shaft, m', before named. The required motions are to be imparted to the induction and eduction valves by suitable valve gear taken from the crank shaft, as before stated; and as the two single-acting engines are connected with one and the same crank shaft with the cranks on opposite sides, as the pistons of one are impelled by the heated air, any power required to cause the pistons of the other engine to return will be derived from this source, if the momentum of the moving parts be not sufficient for this purpose."

"Having described the construction of one of the engines with its regenerator and heater, and stated that the two single-acting engines are alike in every respect, as indicated by corresponding letters of reference, and having also described in what manner the two are connected, I will now" proceeds the writer, "describe the mode of operation, assuming that the furnaces of the heaters have been properly fired up.

"By means of a hand air-pump applied to the chamber, p, at one end of the regenerator, or any other part of the regenerator or heater tubes, a supply of atmospheric air is introduced at about the pressure of the atmosphere, and then the engine is in a condition to begin its operations. The cranks should be turned over or beyond the dead point, as usual in steam-engines.

"Starting with the pistons of one engine in the position represented in fig. 2, at the extremity of their outward stroke, as the crank, s', moving in the direction indicated by the arrow, is making that part of its circuit near the outer dead point, and therefore imparting but little motion to the working piston, b', the supply piston, c', is carried from the working piston and towards the head of the cylinder with a rapid motion by the action of the cam, k', on the roller, i', of the arm, g', the cam rotating in the direction of the arrow, and its acting face being formed as represented, that the piston may be gradually started, rapidly accelerated, and near the end gradually arrested, and there retained in a state of rest as the extremity of the cam passes the roller. During this inward motion of the supply piston, the working piston makes but a small portion of its inward stroke, and therefore the valve, d', in the working piston will be opened by the pressure of the atmosphere to permit cold air to enter and fill that part of the cylinder between the two pistons. So soon as the

supply piston stops, the exhaust port closes, and the continued inward motion of the working piston begins to compress the cold air thus supplied, which of course closes the self-acting valve, d', through which the supply was admitted by atmospheric pressure. This supplied cold air continues to be compressed by the working piston until the end of its inward stroke, and as the power for effecting this compression is derived for the time being from the other engine, it is important to observe the condition of the connections. At the time the supply piston of one engine is started and the air is entering by atmospheric pressure, and when the arm, o', on the rock shaft, p', with which the piston is connected by the rod, n', is at its greatest leverage, the corresponding arm of the rock shaft of the opposite engine is at its shortest leverage, but as it is moved inwards, and the supply air, by reason of being gradually compressed, increases the resistance, the arm, o', gradually shortens in leverage, and the same arm of the opposite engine gradually, and in nearly the same ratio, increases in leverage on the principle of the bent lever, thus applying the power required to compress the supply air to the best advantage. It should be borne in mind, however, that the power thus applied to compress the supply air is not actually expended but merely borrowed, for it is so much added to the elastic force of the air, by which when heated the engine is impelled.

"Just before the supply piston begins the inward stroke just described, the eduction valve, g, is opened, the induction valve, h, having been previously closed, so that the charge of heated air, by which the previous stroke of the engine was effected, is permitted to escape freely into the atmosphere, so that the power required to move the supply piston inward is very slight, the air escaping freely to the atmosphere on one side, and entering by atmospheric pressure on the other through the valve, d'; but as the heated air exhausts or escapes from the cylinder, it passes around and among the series of small tubes, k, of the regenerator, thus imparting its heat through the metal of the tubes to the cold air contained inside of the tubes, which air is thus partially heated preparatory to being finally heated in passing through the heater tubes. In this way much of the heat which would be otherwise wasted is saved.

"The supply of cold air having been introduced and compressed, the engine is prepared to be impelled by the expansive force of the heated air. The eduction valve, g, having remained closed during the greater part of the inward motion of the working piston, the induction valve, h', is now opened, which admits the heated air from the heater to the cylinder, by which the supply piston is forced outwards towards the working piston. The form of the face of the cam, l', as represented is such as to cause the piston to be carried back with a rapid accelerated motion until it comes nearly in contact with the working piston, and at first in this outward motion of the supply piston the already compressed supply air between the two pistons is still further compressed, not by the power of the engine, but by the elastic force of the heated air; the supply piston being, as it were, suspended between the heated air from the heater on one side and the cold air on the other, with the self-acting valve, r (in the side of the cylinder), interposed between the two; for it must be remembered that as the heater and regenerator are in communication, the air, which is a perfectly elastic fluid, will be under equal pressure in both, notwithstanding a portion is more highly heated than the other; and as the supply air in the cylinder is simply separated from the air in the regenerator by the interposed valve, r, in the side of the cylinder, the supply piston will be moved outwards by the heated air until the supply air is compressed to an equal tension, and then the further motion of the supply piston, effected by the cam, l', as it approaches the working piston will transfer the supply air from the cylinder to the regenerator through the valve, r. The only power expended by the engine in this transfer will be the small amount required to move the supply piston between two equal pressures to give the slight preponderance to the one necessary to open the valve, r, through which the transfer is made. The moment the supply piston passes this valve and overtakes the working piston, the preponderance of pressure ceases, and the valve closes by gravity. If desired, however, a positive motion properly regulated may be imparted to this valve by a suitable valve gear. The operations just described for the final compression and transfer of the supply air take place during the time that the working piston is at rest, or nearly so. It is whilst the crank is passing the dead point farthest from the arm, q', connected by the rod, r', with the crank, and as the crank and the connecting rod have their centres of motion at the time of passing the dead point on the same side of their points of connection, it follows that during the time the crank moves a given distance each side of the dead point, the piston will move through a distance comparatively much shorter than when the crank moves the same distance each side of the opposite dead point, for in the one case the crank and the connecting rod simply represent the radii of two excentric circles, whilst in the other they represent the radii of two opposite circles. By the time the supply piston reaches its nearest proximity to the working piston, the latter has made but a very small part of its outward stroke.

"At the time the supply piston passes the valve, *r*, a film of compressed air remains between the two pistons, to act as an elastic cushion; at this time the heated air then in the cylinder is cut off by the closing of the induction valve, *h*, and the working piston is impelled outward by the expansive force of the heated air, and the supply piston by the cam movement described.

"The form of the cam, *I'*, which acts on the roller, *j'*, to govern the outward stroke of the supply piston, must be such as represented, that the piston will move with a rapidly accelerated motion until it approaches the working piston, then gradually retarded, and from the point 1 to 2 its curvature must be such that its motion will be in unison with the motion imparted to the working piston, by reason of its connection with the crank, modified by the interposition of the arms, *o'* and *q'*, operating on the principle of the bent lever.

"It has been shown that the alternating leverage of the arms, *o'*, of the two engines is such as to apply the power for compressing the supply air to the best advantage, and it remains to show the connection between the two in furtherance of this economy. It will be seen that the arm, *o'*, connected with the working piston during the outward stroke, gradually increases in leverage as the heated air by dilatation gradually decreases in tension. Now, the leverage of this arm gradually increases during the outward stroke of the working piston of one engine as it gradually decreases in the other engine, where the working piston is compressing the supply air, and *vice versâ*.

"It has been stated that the power exerted on the working piston to compress the supply air was not an actual consumption, but a mere transfer of power. This will be apparent from the description of the entire operation, because the air thus compressed is transferred to the regenerator, and from the regenerator to the heater, and thence to the cylinder, where it exerts on the piston the elastic force first impressed upon it by the piston, together with the tensive force which it has acquired by being heated, so that the compression which it received at first from the piston when working in one direction it returns to the piston when working in the opposite direction under the advantages due to the arrangement of the two engines, as above specified.

"By the alternate strokes of each engine the required supply of cold air is introduced, compressed, and transferred from the cylinder to the regenerator, carried through the regenerator, thence through the heater, and from the heater back to the cylinder; and in this circuit it is gradually heated, first by the heat which it takes up from the escaping heated air, and then by the heat of the furnace; and as atmospheric air is a bad conductor of caloric, the heat will not be carried back by conduction from the heater to the regenerator, but after the heated air has exerted its elastic force in the cylinder, in escaping it transfers its surplus heat to the supply air on its passage through the regenerator. The object of the regenerator being, however, merely that of economizing fuel, it is evident that the supply air may be passed directly from the cold end of the working cylinder by the action of the supply piston to a heater communicating directly with the other end of the working cylinder."

FARADAY'S EXPERIMENTAL RESEARCHES IN ELECTRICITY.*

In the whole history of science there is probably no example of greater industry and zeal in the pursuit of knowledge for its own sake, than is afforded by *Michael Faraday*. Untiring perseverance—pure and disinterested love of science—careful and cautious experimental investigation; these are pre-eminently the characteristics of the author of the volume before us. A more noble example of the *philosopher*, or real *lover of truth*, has never existed. In admiration of these high and splendid qualities, as well as the many other features which adorn and dignify the personal and scientific character of *Faraday*, we yield to no one, and feel a sincere pleasure in having this opportunity of recording our respect and esteem.

But in the spirit of the old motto, "Amicus Socrates, Amicus Plato, sed magis Amica Veritas," we must also take the liberty of expressing our entire disagreement with several of the *theoretical* views put forth in this volume, and advocated with an earnestness and constancy worthy of a better fate. As to the "*experiments*" recorded in these "Researches," they are beyond any praise of ours, having already received the sanction and applause of the principal scientific men throughout Europe. Never since the dawn of modern science, perhaps, has such a mass of valuable experiments been accumulated by any one man. The three volumes of these "Researches" form an

* "Experimental Researches in Electricity." By Michael Faraday, D.C.L., &c. Reprinted from the "Philosophical Transactions" of 1846-1852. With other Electrical Papers from the "Proceedings of the Royal Institution and Philosophical Magazine." Vol. III. London: 1855.

Encyclopædia of Electricity, gathered by the labours of a very few individuals, the chief contributor by far being Faraday himself.

We propose, in a series of "notices" of this work, to bring before our readers some of the principal *facts* thus discovered, and afterwards to enter more fully into the *theoretical* views of the author.

The present volume contains from the 19th to the 29th "*series*" of the "Researches," (occupying about two-thirds of the volume, the rest being chiefly devoted to theoretical speculations) and comprising the account of Faraday's labours from the year 1845 up to the present time. The former series were published in the *Philosophical Transactions* from 1831 to 1843, (reprinted in two volumes, Vol. 1, in 1839, Vol. 2, in 1844). We shall take them in order.

The first series in the volume (the 19th of the entire series), gives an account of the discovery of the influence of *magnetism* on *polarized light*. We can scarcely do better than quote Faraday's own words.

"(2146.)—I have long held an opinion, almost amounting to conviction, in common, I believe, with many other lovers of natural knowledge, that the various forms under which the forces of matter are made manifest, have one common origin; or, in other words, are so directly related and mutually dependent, that they are convertible, as it were, one into another, and possess equivalents of power in their action. In modern times, the proofs of their convertibility have been accumulated to a very considerable extent, and a commencement made of the determination of their equivalent forces. (2147). This strong persuasion extended to the powers of light, and led, on a former occasion, to many exertions, having for their object the discovery of the direct relation of light and electricity, and their mutual action in bodies subject jointly to their power (*Philosophical Transactions*, 1834, Experim. Researches, 951—955); but the results were negative, and were afterwards confirmed in that respect by Wartmann. (*Archives de l'Electricité*, ii., pp. 596—600).

"(2148).—These ineffectual exertions, and many others which were never published, could not remove my strong persuasion, derived from philosophical considerations; and therefore I recently resumed the inquiry by experiment in a most strict and searching manner, and have, at last, succeeded in *magnetizing and electrifying a ray of light, and in illuminating a magnetic line of force*. These results, without entering into the detail of many unproductive experiments, I will describe as briefly and clearly as I can.

"(2149).—But before I proceed to them, I will define the meaning I connect with certain terms which I shall have occasion to use:—thus, by *line of magnetic force*, or *magnetic line of force*, or *magnetic curve*, I mean that exercise of magnetic force which is exerted in the lines usually called magnetic curves, and which equally exist as passing from or to magnetic poles, or forming concentric circles round an electric current. By line of *electric force*, I mean the force exerted in the lines joining two bodies, acting on each other according to the principles of static electric induction, which may also be either in curved or straight lines. By a *diamagnetic*, I mean a body through which lines of magnetic force are passing, and which does not, by their action, assume the usual magnetic state of iron or loadstone.

"(2150).—A ray of light issuing from an Argand lamp, was polarized in a horizontal plane by reflection from a surface of glass, and the polarized ray passed through a Nichol's eye-piece, revolving on a horizontal axis, so as to be easily examined by the latter. Between the polarizing mirror and the eye-piece, two powerful electro-magnetic poles were arranged, being either the poles of a horse-shoe magnet, or the contrary poles of two cylinder magnets; they were separated from each other about two inches in the direction of the line of the ray, and so placed that, if on the same side of the polarized ray, it might pass near them; or, if on contrary sides, it might go between them, its direction being always parallel, or nearly so, to the magnetic lines of force. After that, any transparent substance placed between the two poles, would have passing it both the polarized ray and the magnetic lines of force, at the same time, and in the same direction.

"(2151).—Sixteen years ago, I published certain experiments made upon optical glass, and described the formation and general characters of one variety of heavy glass, which, from its materials, was called silicated borate of lead. It was this glass which first gave me the discovery of the relation between light and magnetism, and it has power to illustrate it in a degree beyond that of any other body; for the sake of perspicuity I will first describe the phenomena as presented by this substance. (2152). A piece of this glass, about 2 inches square and 0·5 of an inch thick, having flat and polished edges, was placed as a *diamagnetic* between the poles (not as yet magnetized by the electric current), so that the polarized ray should pass through its length; the glass acted as air, water, or any other indifferent substance would do; and if the eye-piece were previously turned into such

a position that the polarized ray was extinguished, or, rather, the image produced by it rendered invisible, then the introduction of this glass made no alteration in that respect. In this state of circumstances, the force of the electro-magnet was developed by sending an electric current through its coils, and immediately the image of the lamp-flame became visible, and continued so as long as the arrangement continued magnetic. On stopping the electric current, and so causing the magnetic force to cease, the light instantly disappeared; these phenomena could be renewed at pleasure, at any instant of time, and upon any occasion, showing a perfect dependence of cause and effect. (2153).—The voltaic current which I used on this occasion was that of five pair of Grove's construction, and the electro-magnets were of such power that the poles would singly sustain a weight of from twenty-eight to fifty-six or more pounds. A person looking for the phenomenon for the first time, would not be able to see it with a weak magnet. (2154).—The character of the force thus impressed upon the diamagnetic, is that of *rotation;* for when the image of the lamp-flame has thus been rendered visible, revolution of the eye-piece to the right or left, more or less, will cause its extinction; and the further motion of the eye-piece to the one side or other of this position, will produce the re-appearance of the light, and that with complementary tints, according as this further motion is to the right or left hand.

"(2155).—When the pole nearest to the observer was a marked pole, that is, the same as the north end of a magnetic needle, and the further pole was unmarked, the rotation of the ray was right-handed; for the eye-piece had to be turned to the right hand, or clock fashion, to overtake the ray, and restore the image to its first condition. When the poles were reversed, which was instantly done by changing the direction of the electric current, the rotation was changed also, and became left-handed, the alteration being to an equal degree in extent as before. The direction was always the same for the same *line of magnetic force.*"

The same phenomenon was produced by the action of a good ordinary steel horse-shoe magnet, no electric current being used. "The results were feeble, but still sufficient to show the perfect identity of action between electro-magnets and common magnets in this their power over light."

"(2160.)—Magnetic lines, then, in passing through silicated borate of lead, and a great number of other substances, cause these bodies to act upon a polarized ray of light when the lines are parallel to the ray, or in proportion as they are parallel to it: if they are perpendicular to the ray, they have no action upon it. They give the dia-magnetic the power of rotating the ray; and the *law* of this action on light is, that if a magnetic line of force be *going from* a north pole, or *coming from* a south pole along the path of a polarized ray coming to the observer, it will rotate that ray to the right hand; or that if such a line of force be coming from a north pole or going from a south pole, it will rotate such a ray to the left hand."

Such is the discovery of the influence of magnetism on polarized light.

The same effect was produced by simply using *helices* of wire, through which the electric current was sent; these helices being made to surround the substance through which the polarized ray passed. Fluids could thus be operated on by enclosing them in glass tubes, and the wire coiled round the tubes. The helices, in fact, acted as magnets, thus affording one more proof of the accuracy of Ampère's well-known theory of the connection between magnetism and electricity. For the numerous other particulars of these experiments, and the variety of substances found to possess the properties above described, we must refer our readers to Faraday's work. We shall now extract some of his concluding reflections on these facts:

"(2221).—Thus is established, I think, for the first time, a true, direct relation and dependence between light and the magnetic and electric forces; and thus a great addition made to the facts and considerations which tend to prove that all natural forces are tied together, and have one common origin. It is, no doubt, difficult in the present state of our knowledge to express our expectation in exact terms; and though I have said that another of the powers of nature is in these experiments directly related to the rest, I ought, perhaps, rather to say that another form of the great power is distinctly and directly related to the other forms; or that the great power manifested by particular phenomena in particular forms is here further identified and recognized by the direct relation of its form of light to its forms of electricity and magnetism.

"(2222).—The relation existing between *polarized* light and magnetism and electricity is even more interesting than if it had been shown to exist with common light only. It cannot but extend to common light; and as it belongs to light made, in a certain respect, more precise in its character and properties by polarization, it collates and connects it with these powers, in that duality of character which they possess, and yields an opening which before was wanting to us for the appliance of

these powers to the investigation of the nature of this and other radiant agencies." "(2227). If the magnetic forces had made these bodies magnets, we could, by light, have examined a transparent magnet; and that would have been a great help to our investigation of the forces of matter. But it does not make them magnets, and therefore the molecular condition of these bodies, when in the state described, must be specifically distinct from that of magnetized iron, or other such matter, and must be a *new magnetic condition;* and as the condition is a state of tension (manifested by its instantaneous return to the normal state when the magnetic induction is removed), so the *force* which the matter in this state possesses and its mode of action must be to us a *new magnetic force* or *mode of action* of matter. (2228). For it is impossible, I think, to observe and see the action of magnetic forces, rising in intensity, upon a piece of heavy glass, or a tube of water, without also perceiving that the latter acquire properties which are not only *new* to the substance, but are also in subjection to very definite and precise laws, and are equivalent in proportion to the magnetic forces producing them. (2229). Perhaps this state is a state of *electric tension tending to a current;* as in magnets, according to Ampère's theory, the state is a state of *current.* When a core of iron is put into a helix, everything leads us to believe that currents of electricity are produced within it, which rotate or move in a plane perpendicular to the axis of the helix. If a diamagnetic be placed in the same position, it acquires power to make light rotate in the same plane. The state it has received is a state of tension; but it has not passed on into currents, though the acting force and every other circumstance and condition are the same as those which do produce currents in iron, nickel, cobalt, and such other matters as are fitted to receive them. Hence the idea that there exists in diamagnetics, under such circumstances, a tendency to currents, is consistent with all the phenomena as yet described, and is further strengthened by the fact that, leaving the loadstone or the electric current, which by inductive action is rendering a piece of iron, nickel, or cobalt magnetic, perfectly unchanged, a mere change of temperature will take from these bodies their extra power, and make them pass into the common class of diamagnetics."

These extracts will place before the reader a tolerably clear notion of the phenomena, and of the views entertained by Faraday regarding them. We perfectly coincide with these views so far as they consist in merely referring the action of magnetism on light to the *constrained condition* or *state* of *tension* produced by the magnetic forces on the molecules or particles of the body on which they act. It is well known that polarization of light may be easily produced by simple mechanical means—such as pressure applied to glass, for instance; this pressure or external force producing a constrained condition or tension in the particles of the glass, and thus affecting the passage of a ray of light through the body. (See Sir John Herschel's article on "Light," in the *Encyclopædia Metropolitana,* pages 562—568.) A change of temperature produces similar effects. As an example of this class of effects, we quote the following from a paper of Professor Dovè, of Berlin, on the "Circular Polarization of Light" (translated in Taylor's "Scientific Memoirs," vol. i., part 1): "To alter the refraction of rays in a crystallized lamina by pressure or change of temperature, so that it may exhibit the desired effect in a given thickness, would afford no convenient practical arrangement. It is, however, very easy, by means of pressure, or cooling, to change the uncrystallized into a double-refracting body, which gives precisely the required effect. In the apparatus proposed by Fresnel, consisting of four prisms, by which the double refraction of the glass is directly indicated, one of the two images which arise is polarized parallel to the axis of compression, and the other perpendicular to it; whence it follows that the axis of double refraction coincides with the axis of compression. If a square or circular plate of glass therefore is compressed so that the axis of compression forms an angle of 45° or 135°, with the plane of primitive polarization, the light passing through the centre of the glass at a certain degree of the pressure will be circularly polarized."

Since, therefore, the *effects* of simple mechanical compression are so similar to those produced by magnetism, we are fully authorised in concluding that the two *causes* are similar; and that magnetism always produces a *constrained* condition or state of tension in the interior of those bodies on which it is made to act. We, for our own part, have no doubt whatever that the whole range of phenomena included under the titles of "Heat," "Light," "Electricity," and "Magnetism," depend entirely on the relations existing between the particles or atoms of bodies and the particles of *ether,* or the elastic medium which pervades space. If we only knew the exact forces acting between these ultimate particles and those of the ether, we should be able to calculate, with rigid mathematical accuracy, all the resulting phenomena, just as we *are* able to calculate astronomical phenomena by know-

ing the law of force by which large masses of matter act on each other. Much has already been done towards the detection of these molecular forces; in the department of optics especially, where theory and experiment together have within the last fifty years created a perfectly new science.

(*To be continued.*)

INSTITUTION OF CIVIL ENGINEERS.

December 18, 1855.

ANNUAL GENERAL MEETING.

James Simpson, Esq., President, in the Chair.

The report of the council for the past session was read, and the meeting proceeded to the election of the president, vice-presidents, and other members and associates of the council for the ensuing year, after which the medals and premiums awarded for papers were presented.

The depressing influence of political events upon works of civil enterprise was noticed; as were the excellent services of the military members, in their own peculiar sphere—of the civil engineers in the army-works corps—in the organisation and construction of the hospital of Rankoi—and in the performance of numerous other duties, whereby it was admitted that a recurrence of the disasters of the last winter would in all probability be effectually provided against.

The Great International Exhibition of Products of Industry, held at Paris, was commented upon at some length; and was admitted to have been in some respects more interesting than that of London in 1851; there were better displays from the colonies; the machinery and wrought metals of the Continent generally, and the agricultural implements and machinery of France in particular, exhibited great progress, and the foreign machines for textile fabrics showed more attention to accuracy of fitting, and considerable advance in mechanical skill. These features were more apparent, in consequence of the inadequate manner in which many important branches of British industry were represented; for instance, there were only two English locomotives among the twenty railway engines exhibited — fourteen of which, however, bordered on the system introduced by Mr. Crampton. The models of the great works of civil engineering were, with few exceptions, exhibited only by the Ministry of Public Works of France, and by Members of the Institution of Civil Engineers, and a well-merited tribute was paid to the excellent and liberal spirit which animated the Fourteenth class, composed almost entirely of French engineers, by whom the only two grand prizes of honour were recommended to be awarded to Mr. Stephenson and Mr. Rendel, whilst the decoration of the legion of honour had been requested for Mr. Stephenson and Mr. Brunel, and a large number of prizes of honour, and of medals of the first and second classes, and honourable mention had been awarded to other members and associates of the institution.

Feeling the importance of the occasion, the council had not hesitated to deprive the institution, even for an inconveniently long period, of the services of Mr. Manby, the secretary, in order to his proceeding to Paris to fill the post of vice-president of the fourteenth class (civil constructions), as soon as it was found that other members who had been appointed to the jury could not attend, and the manner in which the duties had been performed was noticed approvingly.

A short sketch was given of the principal works commenced, completed, or having made considerable progress during the past year, in Great Britain, on the Continent, in India, in the United States of America, and in the Colonies.

A historical notice of the various attempts to obtain the adoption of a plan for the sewerage of the metropolis, showed that since the year 1847, there had been created five commissions, all armed with powers to decide upon, and to raise money for the execution of some comprehensive scheme; but that constant impediments had been opposed to this essential work, and even up to the last moment the valuable time of the commissioners had been frittered away in useless and personal discussions upon crude theories, instead of devoting the energies and good sense of the commissioners to devising means for executing plans which had received the approbation of the first engineering talent of the day. It was hoped that the good sense and business habits of the newly-appointed representative commission would put an end to this state of things, and that this work, so important to the sanitary state of the metropolis, would be forthwith proceeded with.

The statement of the receipts and expenditure of the past year showed, that the funds had at last reached the point to which it had been the object of the council to bring them; that there was an available balance sufficient for the annual publication of a volume containing the minutes of proceedings of the current session, and with any other funds that might be furnished, it was proposed to bring up the arrears of publication; the first part of volume fourteen for the session 1854-5 had been issued, and with it a statement of the subscription to

the publication fund, in the hope that by thus directing attention to the subject, those members who had not hitherto contributed would be induced to do so. It was announced that the second and concluding part of volume fourteen was partially in type, and would be issued by the month of March; that in accordance with the instructions of the council, the papers read during the present session were already printed, and that the complete volume would be in the hands of the members as soon as was practicable after the end of the session, and the arrears were ordered to be printed with all speed, giving the discussions in those volumes in a more succinct form.

It was also stated, that in order to facilitate this arrangement, the president had taken upon himself the entire expenses of the annual conversazione.

The thanks of the institution were unanimously voted to the president, for his liberality, and his attention to the duties of his post; to the vice-presidents and other members and associates of council for their support of the president, and their constant attendance; as also to the auditors, the scrutineers of the ballot, and to the secretary, for their several services.

The following gentlemen were elected to fill the several offices in the council for the ensuing year:—Robert Stephenson, M.P., president; G. P. Bidder, I. K. Brunel, J. Hawkshaw, and J. Locke, M.P., vice-presidents; W. G. Armstrong, J. E. Errington, J. Fowler, C. H. Gregory, T. Hawksley, J. R. M'Clean, J. Penn, J. S. Russell, J. Whitworth, and N. Wood, members; and W. Piper and G. F. White, associates.

SILVESTER'S SPRING BALANCES.

Mr. J. Silvester, engineer, of Smethwick, patented on the 25th of April last an invention which consists in the application to spring balances used with the safety valves of steam boilers, of certain mechanical appliances that are intended to ensure a more delicate action of the valves, and admit of a regular and easy discharge of steam immediately on the pressure exceeding the point to which the balance is adjusted, and to any amount, without increase of pressure, whilst by the same means any tampering with the valves is also prevented.

Fig. 1 of the annexed engravings is an elevation of one of the improved balances regulated to a pressure of 100 lbs. to the inch; figs. 2 and 3 are sections through the working parts. A is a barrel, similar to the barrels of the balances in ordinary use; and B is an arm, which has a screw turned upon it for the greater portion of its length, and is secured to the boiler at D, and by the joint D to the piston C. To the arm B is attached the forked lever E, working by means of

Fig. 1. Fig. 2.

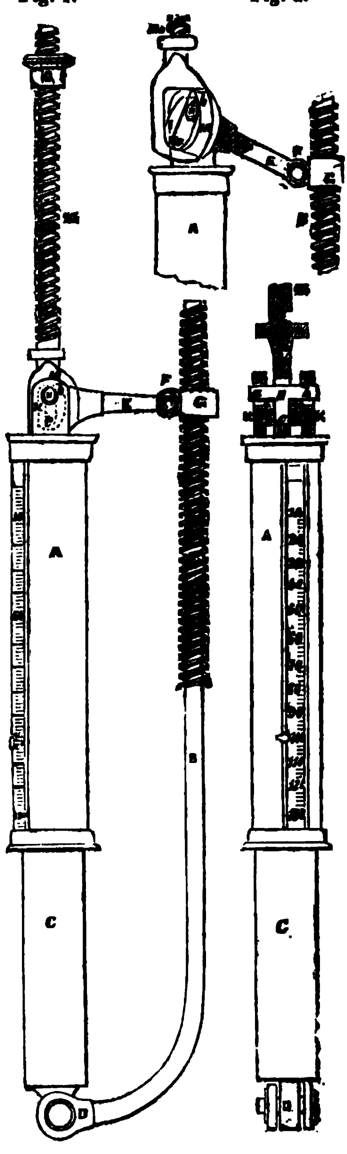


Fig. 3.

the joint of F and screw box G with the arm B. H is a three-armed axis, furnished with three knife-edged centres *a*, *b*, *c*, and is securely held in the jaws I, I, of the lever E; K, K, are cheek pieces fixed on the

barrel A, and in which the two knife centres *a*, *b*, work, the third centre *c* working in the bow M at the foot of the screw *m*. Figs. 1 and 3 represent the balance, adjusted to a pressure of 100 lbs. to the inch; and it will be seen that the centres *a*, *b*, *c*, are in a vertical position, the lever E being in the same plane at right angles with them; but as the pressure increases, the lever arm of the safety valve engaging on the under side of the nut O, the barrel A is raised, drawing the lever E and the centres *a*, *b*, *c*, out of the plane in which they are seen into the position seen in fig. 2; this action, by throwing the centres *a*, *b*, upon which the barrel hangs nearer to the fulcrum F, produces the effect of allowing the lever to rise without increase of pressure, whilst this motion of the centres from their delicate adjustment allows the screw *m*, upon the slightest increase of pressure, to raise and liberate the lever of the safety valve, and consequently admits of the free escape of steam until the pressure is reduced to the gauge indicated; the parts of the balance then assume their original positions. "This form of balance is not only self-acting," says the inventor, "but should any attempt be made to tamper with it, it is self-correcting; for, if by means of the nut O the lever of the valve be screwed down to increase the pressure, the barrel A, by the nice adjustment of the centres or axes will immediately be raised, and throwing the centres nearer to the fulcrum F will prevent the pressure being increased; whilst the joint F, being a locked joint, or, if preferred, a nut and screw, as shown, any attempt to alter the indicated pressure, by running the screw box G up or down the screw B, will be impossible. It is therefore manifest that if this balance be gauged to a pressure of 100 lbs. to the inch, or any other given pressure, the safety valve will rise instantly on that pressure being exceeded, and not, as is often the case with ordinary balances, require an extra pressure to perhaps 15 or 20 lbs. on the inch before the necessary vent is given."

A modification of this apparatus may also be made by employing in lieu of the centres *a*, *b*, *c*, a triangular cam piece which will answer for these centres. In this case the bar *m* is linked to the lower angle of the cam, the upper one being linked to the head of the balance, and the third angle pinned to a fulcrum on the boiler; but as the principle is the same in both, further description is unnecessary.

PHOTOGRAPHS OF THE SUN'S DISC.

We learn from the annual report of the Kew Committee, presented to the Council of the British Association, that the apparatus suggested by Sir John Herschel for photographing the spots on the sun's disc is progressing under the superintendence of Mr. Warren De la Rue. The solar photographic telescope was promised by the maker complete in three months: the object-glass was finished, and some progress had been made with the stand. The diameter of the object-glass is 3·4 inches, and its focal length 50 inches; the image of the sun will be 0·465 inches, but the proposed eye-piece will, with a magnifying power of 25·8 times, and focal length *x*, increase the image to 12 inches, the angle of the picture being about 13° 45′. The object-glass is under-corrected in such a manner as to produce the best practical coincidence of the chemical and visual foci. (Mr. Ross has found, that if for the greatest intensity of vision, in common lenses, the ratio of the dispersive powers of the two media is 0·65, that the chemical and visual foci will coincide best practically when with the same media the ratio is altered to 0·60, the media he sometimes uses being Pellatt's flint and Thames plate.) The eye-piece consists of two nearly achromatic combinations, their forms, foci, and focal lengths being arranged upon the basis of the photographic portrait lens, the conditions being nearly similar.

It is contemplated to form the system of micrometer wires on a curved surface; and it may ultimately be found to be advantageous also to curve the photographic screen as the small curvature necessary, namely, about two-tenths of an inch, will present no mechanical difficulties. As in practice it may possibly be found desirable not to produce the sun's image with too great rapidity, a provision is contemplated for the absorption of some of the most energetic active rays by the interposition of coloured media of different tints.

The telescope being for a special object, it will have no appliances except such as appertain exclusively to that object, so that the only means provided for *viewing* the sun will be through the finder intended for facilitating the adjustment of the sun's image in position as regards the micrometer. The polar axis will be furnished with a worm-wheel and clock-work driver, and the declination axis with a clamping circle. A shutter for covering the object-glass, and capable of being rapidly moved by the observer, will be so contrived as to be under his command, whether he be at the time near the object-glass or near the screen, eight feet distant.

It was originally intended to place the telescope in an observatory 12 feet in diameter, provided with a revolving roof; adjoining the observatory a small room for chemicals was to have been constructed, so

as to facilitate the fixing of the pictures. It has, however, been found possible to somewhat alter the construction of the tube, so as to reduce its length sufficiently to allow of the telescope being placed under the dome of the Kew Observatory, which is only 10 feet in diameter.

A Manual of Photographic Chemistry, including the Practice of the Collodion Process. By T. FREDERICK HARDWICK, late Demonstrator of Chemistry in King's College, London. *Second Edition.* London: John Churchill, New Burlington-street. 1855.

THE science of photography, though practically of very recent origin, has already so many ardent students, that a sound text-book on the subject is greatly in demand. Such a text-book must necessarily be of a chemical character, since the science was originated, and has been developed, mainly by chemical processes, and the practice of the photographer consists almost exclusively of a series of chemical manipulations. Mr. Hardwick, in this Manual, has provided the student with precisely what he requires; viz., a careful, exact, and elaborate statement of the laws which underlie the entire science, and such practical illustrations as tend to fix a knowledge of these laws in the mind. The work is of an elementary character, and may be consulted by persons previously unacquainted with chemistry. We strongly recommend a serious study of it to all who are about entering upon the pursuit of this science, or who have hitherto made abortive attempts to produce photographs, as many within our knowledge have done. No pains have been spared in the preparation of the work, and the success of the author is equal to his efforts.

ON PERMANENT WAYS.

To the Editor of the Mechanics' Magazine.

SIR,—Upon the introduction of the railway system, our knowledge of such constructions had to be founded upon data drawn from experience in works bearing a similarity thereto; and often the question of the strength of the materials for constructing some of the numerous details of the system had to be decided without even this slender assistance. As the system became extended, and our experience thereby enlarged, various changes and improvements were the consequence; and now it may almost be termed a perfect system in some respects; but yet there are points of importance in the proportion and construction of a permanent way that still require our serious attention. I allude to the various plans used for securing the rail to the sleeper, or what is usually termed and known as the "chair." There is a great variety of forms used; but it may be as well to point out the elements that constitute a good chair, and see how far those in use agree with them. The first principle, therefore, that ought to be observed should be its perfect simplicity, consistent with safety, both in the form and number of parts. The means employed in securing the rail in such chair should also be capable of ready adjustment, and not liable, when once set, to get out of order or place. The rail should also be held firm, without injury to the edges, so that either may be brought into use after the wear of one. The chair should also be so formed that the rail may be laid in its proper place after the chair has been duly bolted down to the sleeper, thus preventing the necessity of the *plate-*layer carrying the chairs along with the rail; by this means a greater length per day may be laid down. The chair in its fastenings should also admit of the nearest approach to a regular curve being formed, compatible with the length of the straight line of rail. The means for fastening should be so that any irregularities in the thickness of the rails can be provided for; and for this reason all joint chairs ought to key up with separate wedges, or other suitable apparatus, on each side of the joint, these keys forcing the rail against the uniform fast cheek of the chair, which ought to be sufficiently wide to admit of a good bearing for the ends of each rail. All oscillation, or working at the joints, should be avoided, either from vertical pressure, or the horizontal force of the carriage wheels.

Having thus stated a few of the principles that guide us in the formation of what may be considered a good and secure chair, I will proceed to point out and examine a few of the examples at present in use, and see how far they agree in the views expressed above. The first chair used on permanent ways was formed with a fast cheek to suit the curve or outline of the rail, the same being held against it by means of a wooden key or wedge. In this case the key is liable to be acted upon by the changes of atmosphere, which produces corresponding changes in the firmness of the rail; and there was no provision made for the irregular thickness of the same, neither is the key prevented from being withdrawn by the motion of the rail produced by the pressure above referred to, which has a constant tendency to compress the key in its dimensions parallel with the line of rail; the consequence is, that unless particular attention be paid the key is often found out of its place altogether. In a joint chair this wedge cannot hold each end of the rail with

equal firmness. Iron wedges have been substituted to remedy their defects; but as no means have been used to prevent their withdrawal from the cause above mentioned, no advantage has appeared to be derived from such a change, and because in this arrangement the equal thickness of the rail is not provided for. There are also other methods of securing the rail in this chair, such as the hollow iron wedge, &c., which, as they have all alike failed in their object, it will not be necessary to particularize. I will therefore proceed to describe other forms of chair possessing new features.

Casting the chair in chills upon the rail has been extensively adopted; and as this form requires no wedges at all, it produces a good and firm hold of the rail without bolts or other means being used at the joints for the purpose of "fishing;" but it has yet this great and fatal disadvantage, that should the rail require to be removed at all the chair must be destroyed, or the whole line taken up, which adds considerably to the repairing cost of a permanent way; and also, as the rails now generally adopted are formed so that both edges may be used, new chairs are required to allow of this being done, as well as the great difficulty of producing curves, arising from the joint in the chair and rail being so rigid. Chairs have been cast in chills apart from the rail, for the purpose of giving to the abutment-cheek a hard even surface, and also to ensure each chair being the same size in all its members. A good casting may be produced in this manner, and time saved in fixing them; but the defect is the same in the first case mentioned, namely, in the wedging or keying-up. Another feature may be pointed out in which the chair is formed in two distinct portions, having one side only cast upon the base for resting upon the sleeper, the other side or cheek, which is also made to the form of the rail, being secured by means of bolts beneath (or through) the rail, producing a result without the wedges; and it is easily adapted for "fishing" also, besides being readily adjusted; but as the force applied to the rail is above the bolts, a loss of leverage instead of a gain is the result, and no gain can be produced by carrying the fulcrum farther from the under side of the rail, so that the means of security depend entirely upon the two bolts aforesaid. There is yet another form we may mention, in which the wedge is made of the same curvature as the rail, and slightly tapered; the wedge being in this case made of metal, and driven in the ordinary manner, so that the rail is secured by this means between the fast cheek and the abutment for the wedge aforesaid, and the same is further held by a bolt through into the sleeper. This example is liable to nearly all the defects pointed out in connection with the first, and need not, therefore, be repeated here. Fishing the joints of the rails in permanent ways has been extensively adopted, the ordinary method being, a plate on each side of the rail secured by bolts, through the rail, and each other. This arrangement produces a good and secure joint at first; but in course of wear, the holes in the rail are enlarged, allowing thereby the plates to become loose and useless, and unless new holes and bolts be substituted, the joint would be quite as secure without their aid at all, and it will be readily seen that the cost of repair must consequently be great. In the above remarks are stated, in the first place, the elements that are required to constitute a good, secure, and economical chair, for permanent ways; and, secondly, the defects of a few at present in use; this being done with the object of drawing the attention of engineers and others engaged in such constructions to such an important subject, rather than to advance any views of my own. Should it elicit any such improvement a great service will be rendered, and your insertion will oblige.

I am, Sir, yours, &c.,

ENGINEER.

Manchester, November, 1855.

STEAM BOILER EXPLOSIONS.

To the Editor of the Mechanics' Magazine.

SIR,—In Mr. Longridge's paper on the causes of steam boiler explosions contained in your Magazine—which paper, by-the-bye, appeared to be most favourably received by the Association—he furnished some evidence that there may be possible conditions under which heat can exist in approximation with steam without the latter increasing in elastic pressure; and also without this heat being communicated to the water beneath.

It appears to me that this view of steam boiler explosions is not so absurd as it at first appeared to be. Liebig says, "That during the act of freezing, the temperature remains at 23° Fahrenheit. Nevertheless water may be cooled as low as 5° without becoming solid, if the fluid be in a state of perfect rest, but that the least disturbance is sufficient to effect congelation."

Seeing that effects are very similar at extremes of temperature, it may not be very unreasonable to surmise that the *liquid* and vapour in a boiler may be in such a state of rest, *that heat may accumulate in their interstices without chemical union being effected.* But if this be so, or even if the heat be solely confined to the steam space, this pregnant cause, if such, of boiler explosions can be easily remedied, as suitable mechanical

action is alone required; and my object in writing, is simply to say, with your permission, that if this view be correct, the introduction of a *fan or beater* within the boiler, with its shaft passing through the water line having suitable motion communicated externally, should prevent these calamitous occurrences; and as the Association intend to experiment on the matter, they may think such a suggestion worth their notice.

I am, Sir, yours, &c.,

JOHN RAMSBOTTOM.

Accrington, December 25, 1855.

Mr. J. Player, C. E., Manager of the Britannia Iron Works, writes from Berg, Gladbach, in Prussia, to the *Mining Journal*, as follows:

"I see a notice of a valuable Association for the Prevention of Steam Boiler Explosions, and in their report the deficiency of water was stated to be the most frequent cause of explosions, and open stand pipes, and fusible metal plugs, are recommended as preventives. Although so many celebrated men are members of this association, I must differ from them, as in my many years' experience I have not found that safety in fusible plugs which I had been taught to expect, and have abandoned their use, in consequence of finding that, in several instances, the internal flue of a so-called Cornish boiler, in which lead plugs were riveted, became red-hot (from deficiency of water), without the steam escaping through the plug-hole. On examination, I found that the top part of the lead plug was oxidised, and, being covered with boiler scale, acted as a valve upon the plug-hole, although the lower part of the plug, and that part in the thickness of the plate, were melted away.

"I will not condemn the method recommended without suggesting another plan, which is used in some boilers in this country, and which, I think, gives great safety. It consists of an arrangement by which high or low pressure boilers may be fed, and the water kept always at the proper level, without the aid of a force-pump. This plan so simplifies the engine, and insures such regularity of feed, that I will venture a description, trusting that its merits will be appreciated. The largest boiler to which I have seen it applied is for a high-pressure blast-engine, and is about 90 feet long and 6 feet diameter across. Over this boiler is placed a short boiler, or reservoir, about 12 feet long and 6 feet diameter. This is connected with a feed-tube passing from the bottom of the upper to the bottom of the lower boiler, with a stop-cock between the two, and also a tube passing from the water level of the under to the upper part of the upper boiler, also provided with a stop-cock. There is also a very small trial-cock in the top of the upper boiler, left a little open, and also a large 5-inch or 6-inch pipe connecting the upper boiler (which should hold five or six hours' supply), with a water-reservoir above its level. The *modus operandi* is thus:—Shut the two cocks connecting the two boilers, and fill the upper boiler with water from the reservoir; then shut the valve or cock between the water-reservoir and upper boiler, and open the two cocks of the tubes, and the lower will feed itself until the water is all absorbed; and then repeat the operation of filling the upper boiler, which is done in a few minutes. Trial-cocks and a water-glass should be attached to the end of the upper boiler, as well as to the lower."

DESIGN FOR A FUNERAL CARRIAGE.

To the Editor of the Mechanics' Magazine.

SIR,—Allow me to offer to your notice a design for a new funeral carriage, combining the present hearse and coach in one, which, if you deem worthy of insertion in your Magazine, would oblige,

Yours obediently, the Designer,

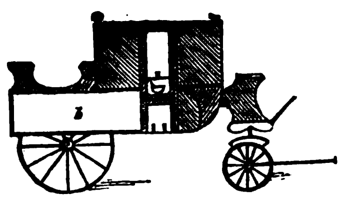
H. LAVEROCK PHILLIPS.

Description.—Fig. 1 is an external view of

Fig. 1.

the carriage, showing seats, *a a*, in the rear for the funeral attendants. Fig 2 is a sectional interior elevation, showing the receptacle, *b*, for the coffin, which is put in at the back of the carriage. The upper sur-

Fig. 2.



face of the front end of this receptacle

forms one of the seats in the body of the carriage.

166, Bermondsey street.

SPECIFICATIONS OF PATENTS RECENTLY FILED.*

RABATTE, T. M. and J. RETTIG. *Improved machinery for bruising, graining, or currying leather, skins, and hides.* Patent dated May 26, 1855. (No. 1202.)

This invention comprises an arrangement of pallets that connect sets of mechanical pummels, so that by causing the hide to slide it may be pummelled in two cross directions; a peculiar suspension of the series of mechanical pummels so arranged as to bruise the skin or hide equally throughout, although the thickness of the same may vary, &c.

AVERY, J. *Improvements in apparatus for conveying heavy weights for bridge-building and other purposes.* Patent dated May 26, 1855. (No. 1203.)

This invention primarily consists of a carriage provided with suitable blocks and tackle, in combination with a permanently-suspended cable, by which a suspended weight may be transferred to any given point, and then raised or lowered at pleasure.

BOTTA, F. T. *A new construcion of furnaces, called mixed furnaces, participating of the heating by the solid fuel, and by the combustion of the gaseous products.* Patent dated May 26, 1855. (No. 1206.)

This invention consists mainly in certain arrangements for generating and consuming the oxide of carbon in a suitable manner, and in applying jets of steam to produce draught, &c.

WATERHOUSE, T. *Improvements in the means of actuating forge and other hammers, which improvements are also applicable to pile driving and other like purposes.* (A communication.) Patent dated May 26, 1855. (No. 1207.)

Claim 1.—Constructing forge hammers and other machines with chambers having adjustable heads or pistons, whereby the spaces within which air is to be compressed may be varied in size, and the expansive force of the compressed air used in the working of such machines increased or diminished. 2. Adapting to such chambers inlet and outlet valves, by means of which the quantity of air to be compressed may be regulated, for the purpose of regulating the action of such machines.

HOWELL, J. B. *A new or improved mode or modes of consuming more effectually the gas and gaseous products evolved during the combustion of fuel.* Patent dated May 28, 1855. (No. 1209.)

This invention consists in admitting air to furnaces through perforated metal plates or tubes.

ROWLANDS, S. *A new or improved instrument or apparatus to be used for purifying or otherwise treating gas.* (A communication.) Patent dated May 28, 1855. (No. 1210.)

The inventor employs an instrument or apparatus in which the gas to be treated is made to pass through a long spiral channel made in a float floating on the liquid to which the gas is to be exposed, the float being so disposed as to be susceptible of a rotary motion by the passage through it of the gas.

SWINTON, E. G. *Improvements in applying motive power for grinding corn, and for other similar purposes.* Patent dated May 28, 1855. (No. 1212.)

Claim.—"The application to carts or other like vehicles of grinding or crushing apparatus, and the driving of the same by rotary motion derived from the running wheels."

MORRISON, J. *A new mode of constructing railways, specially intended to be employed for the transit of carriages or vehicles moved or propelled by human power.* Patent dated May 28, 1855. (No. 1213.)

This invention mainly consists in so constructing a double line of rails that it shall present an uneven or undulating surface to the wheels of carriages.

ROCH, E. M. *Improved apparatus for reading or bringing into sight bills, advertisements, papers, maps, and similar objects.* Patent dated May 28, 1855. (No. 1215.)

Claims 1.—"The idea of showing within the front of a shop-window such placards as were till now stuck and read on walls or boards along streets, or public resorts. 2. The mode of animating the said placards, by means of a continuous motion"!

LEESE, J. jun. *An improvement or improvements for obtaining colouring matter.* Patent dated May 28, 1855. (No. 1218.)

This invention consists in extracting indigo from waste, or linen and cotton rags of every description which have been dyed or printed with indigo, and rendering it available for subsequent use.

WHITEHEAD, J., jun., and R. K. WHITEHEAD. *Improvements in finishing woven fabrics.* Patent dated May 28, 1855. (No. 1219.)

This invention consists—1. In obtaining a finish to "Royal or Paris rib" fabrics by the process of carding, or by equivalent means, whereby a raised surface or surfaces

* For the future, in our Abstracts of Specifications, we shall omit the Christian names, addresses, and professions of patentees, publishing the initial letters only of the Christian names. The whole may be seen in full in the lists of Provisional Protections, to which reference may be made when necessary.—ED. M. M.

are obtained, whether they be subsequently shorn or not. 2. In operating upon fabrics which are woven with patterns, so that a portion only of the surface or surfaces shall be raised.

GRAFTON, H. *Improvements in apparatus for heating and cooking.* Patent dated May 28, 1855. (No. 1221.)

This invention consists in the application of earthenware in moulded forms, as chambers in which to generate and enclose the heat of gas-cooking apparatuses.

COLEMAN, R. *Improvements in the construction of land rollers, and in implements for ploughing and breaking up or scarifying the soil.* Patent dated May 29, 1855. (No. 1222.)

Claims.—1. Constructing land rollers in divisions or parts fitted so that they may adapt their positions to the form of the ground over which they travel, in order to equalize, as much as possible, the pressure on the surface of the earth. 2. Mounting and fitting ploughs or other tilling implements on stems, in such manner that a rising or lowering motion may be imparted to them, independently of any up and down motion of the travelling carriage, for the purpose of inserting such implements into, or withdrawing them from the ground, and otherwise regulating their position as described.

DUNN, D. *Improvements in steam boilers.* Patent dated May 29, 1855. (No. 1223.)

The inventor constructs boilers which slowly revolve on axes, like coffee-roasting machines.

ACKLIN, J. B. *Improvements in the mode of substituting paper to pasteboards in jacquard looms.* Patent dated May 29, 1855. (No. 1224.)

This invention consists in the disposition of a machine or apparatus applied to the jacquard loom, so that light sheets of paper may be used instead of the pasteboards used in such looms for manufacturing ornamented fabrics; and it also refers to an apparatus for punching the paper used in the weaving process.

LAFOND, E. J., and Count L. A. de CHATAUVILLARD. *Improvements in the processes of, and apparatus for, treating mineral, animal, and vegetable matters, for obtaining oils, essences, paraffine, and other similar products.* Patent dated May 29, 1855. (No. 1225.)

The inventors describe certain distilling processes particularly applicable to the treatment of turf, and apparatus for carrying them out, which we will refer to more fully hereafter.

PAYNE, E. J. *Improvements in the manufacture of covered thread.* (A communication.) Patent dated May 29, 1855. (No. 1226.)

These improvements consist in covering cotton thread, or other inferior filaments, with silk, so as to produce a thread which may present the same, or nearly the same appearance as if made entirely of silk.

LANGSHAW, W. and G., and W. JELLEY. *Improvements in machinery for manufacturing fancy fabrics with both sides alike.* Patent dated May 29, 1855. (No. 1228.)

This invention consists in using two warps, and fixing to a bar or shaft a number of double-hooked needles which are made to roll or to perform portions of revolutions alternately, by means of a cam or eccentric, the needles being arranged to form both sides of the fabric alike.

LEE, T. V. *Improvements in generating steam in marine and other boilers.* Patent dated May 29, 1855. (No. 1229.)

Claims.—1. The application of hydro-caloric or surcharged steam for the purpose of generating and maintaining steam in marine and other boilers, as described. 2. The production of fresh water from sea water by passing it in a state of vapour through a heated chamber lined or charged with pumice-stone.

ROGERS, G. *Improvements in apparatus for retaining and drawing off aërated liquors.* (A communication.) Patent dated May 29, 1855. (No. 1230.)

This invention mainly consists in constructing valvular stoppers "with a passage in the valve-stem with two lateral apertures, one of which communicates with the interior of the bottle, and the other with the spout or outlet when the valve is opened."

HENRY, W. A. *Improvements in vices, and in the mode of securing the same to workbenches.* Patent dated May 29, 1855. (No. 1231.)

These improvements consist in enabling the two jaws to turn in sockets, and thus adjust themselves to tapered objects; and also in the employment of a peculiar arrangement for adjusting or setting the fulcrum of the moveable jaw forward or backward, so as to grasp large or small objects with equal facility without altering the tension of its spring.

NEWTON, A. V. *An improved calculating apparatus.* Patent dated May 30, 1855. (No. 1236.)

The principal features of this apparatus are a jointed lever for moving a large numerical indicator, and a pin or its equivalent for acting upon the lever in a certain manner.

WHARTON, E. *Improvements in steam engines.* Patent dated May 31, 1855. (No. 1239.)

This invention consists—1. In a new arrangement of the parts of a direct-acting compound expansive steam engine, and in a new arrangement of the parts of three-port slide valves.

DUNLOP, C. T. *Improvements in the manufacture of chlorine.* Patent dated May 31, 1855. (No. 1243.)

This invention consists in preparing artificial oxide of manganese from the residuum obtained in the manufacture of chlorine. The special process which the inventor prefers to adopt, is the transformation of the chloride of manganese into a carbonate of manganese, by the agency of any well-known means, and the subjecting of the carbonate thus prepared to the action of heat, in contact with atmospheric air.

BICKERTON, S. *An improved oil lubricator.* Patent dated May 31, 1855. (No. 1246.)

In the arrangement described by the inventor an endless chain is passed over a pulley, and hangs down nearly to the bottom of an oil vessel, so that when the cup is charged with oil, and a small shaft caused to rotate by the movement of the shaft to be lubricated, the chain is continually carried over the small pulley, and with it portions of oil are taken up.

COLONGE, A. B. A. B. E. DE. *An improved diving apparatus.* Patent dated May 31, 1855. (No. 1247.)

This apparatus consists of a tube closed water-tight at the bottom, and furnished at the sides with glazed apertures and flexible tubes or gloves, into which the arms of the diver may pass, and by means of which he may lay hold of external objects.

ASHWORTH, R., and S. STOTT. *Certain appendages to and improvements in machinery for preparing, spinning, doubling, twisting, and winding fibrous substances.* Patent dated January 5, 1855. (No. 1248.)

Claims.—1. The adaptation to and employment in frames for preparing, spinning, doubling, twisting, and winding fibrous substances of a compound spindle and tube or collar in combination with an improved flyer, and parts in connection therewith, as described. 2. The pressing together of the rollers used for drawing or pressing fibrous substances by means of an elastic material or spring, in such manner as not to exert any force or weight upon the bearings of the bottom or under rollers, as described.

WORSDELL, T. *Improvements in lifting jacks.* Patent dated May 31, 1855. (No. 1249.)

A full description of this invention will shortly be given.

BROOMAN, R. A. *Improvements in dyeing cotton threads, yarns, and twists.* (A communication.) Patent dated May 31, 1855. (No. 1250.)

These improvements refer to the dyeing of cotton threads, yarns, and twists in red, violet or lilac, and brown, and in the different shades of these colours, by means of madder, garancine, and alizarine. The colours imparted are "fast colours," and the methods adopted by the inventor resemble those employed in printing calicoes.

FONTAINEMOREAU, P. A., L. C. DE. *Certain improvements in the treatment of vegetable and animal oils.* (A communication.) Patent dated June 1, 1855. (No. 1252.)

Claim.—The employment of iodine and an alkali, or iodide of potassium, for neutralizing the acid in Colza and other oils, which, in combination with other ingredients, are used for lubricating machinery.

PEYTON, R., and A. S. STOCKER. *Improvements in the manufacture of bedsteads.* Patent dated June 1, 1855. (No. 1253.)

This invention consists in combining wooden pillars, standards, posts or legs, with metal collars or corner pieces to which the end and side rails are hinged; and in constructing the posts, pillars, or legs so as to receive the metal collars, and secure them firmly thereto.

VENANT, C. I. C. *Improvements in apparatus for roasting coffee and other substances.* Patent dated June 1, 1855. (No. 1254.)

Claims—1. The use of rotating cylinders or chambers with an internal flue or central passage through which the heat passes, whereby the coffee is subjected to heat radiating from the centre, as well as that applied to the exterior of the cylinder. 2. Subjecting coffee after it has been roasted to the action of the aromatic vapours passing off from another parcel of coffee undergoing the process of roasting in a separate chamber.

PELLENZ, J. C. *Improvements in the manufacture of iron wheels.* Patent dated June 1, 1855. (No. 1255.)

The inventor describes a wheel in which a combination of a disc and spokes is employed.

WHYTOCK, R. *Improvements in colouring yarns or threads intended to form elements of various loom fabrics, and for crochet work and knitting.* Patent dated June 1, 1855. (No. 1256.)

Claims.—1. Printing by means of pulleys pressing the yarn upwards against a glass plate or flat substance under which a considerable length of yarn or thread is placed evenly ready to be printed. 2. "Printing by pulleys without table or cylinder, but colouring between revolving pulleys as described."

SPENCER, H. *Improvements in machinery or apparatus for twisting and winding spun yarns or threads.* Patent dated June 1, 1855. (No. 1257.)

This invention consists—1. In placing cops or bobbins of yarn or thread upon spindles for the purpose of imparting additional twists by means of flyers. 2. In winding the yarn or thread after it is twisted

on to vertical bobbins or swifts, the same being driven by friction surfaces.

BOYD, J. *Improvements in letter-press printing machines.* Patent dated June 2, 1855. (No. 1258.)

This invention consists—1. In stopping the impressing cylinders during the back action of the reciprocating table. 2. In the use of conically-shaped impressing cylinders and horizontal circular rotating, or partially revolving tables, as applied to letter-press printing machines. 3. In the application of the quadrant (or sector) motion to the under side of the tables of printing machines to give them a reciprocating motion.

LANE, J. and J. TAYLOR. *An improved engine.* Patent dated June 2, 1855. (No. 1259.)

The inventors employ a circular piston which has a slot across the face of it, and which is fixed on a shaft. In the slot a flat plate or tongue-piece of the full width of the piston is fitted, and extends above the circular face of the piston to the inner circular side of the cylinder in which it is enclosed, and when travelling round has an excentric motion, and runs concentrically to the outer rotating cylinder.

LITTLE, C. *Improvements in machinery or apparatus for the manufacture of envelopes.* Patent dated June 2, 1855. (No. 1262.)

This invention consists—1. In the use of weighted bell crank levers working with one end in a folding box for inclining the flaps of the envelope previous to the second descent of the plunger. 2. In a mode of feeding from a pile of blanks by a peculiar arrangement of lever fitted at the extremity with any suitable soft or elastic substance.

CARTWRIGHT, H. *An improved steam-cock.* Patent dated June 2, 1855. (No. 1263.)

The object of this invention is to balance, or nearly balance, the pressure of the steam upon the plug of the cock, by causing the steam to act upon the plug equally all round it.

ARMELIN, F. C., jun. *Certain improvements in ploughs.* Patent dated June 2, 1855. (No. 1264.)

Claims.—1. The fitting or fastening of the pieces composing the plough by means of wedges and keys so that they may be easily separated and refitted. 2. The addition to the sole of a heel-piece, which may be easily replaced when worn out. 3. A particular construction of ploughshare fastened in by means of wedges, and the employment of a moveable ploughshare point, separate from the feather, and fastened by keys. 4. Certain arrangements for fastening a draught-chain or rod, which serves as a draught-chain. 5. An arrangement for connecting the coulter to the bearer by means of a tie-piece and wedge or key. 6. The general arrangement of parts described.

GODEFROY, P. A. *Improvements in the treatment of gutta percha.* Patent dated June 4, 1855. (No. 1268.)

The principal part of these improvements consists in combining the shells of the fruit of the cocoa nut-tree in a finely ground state with gutta percha.

KAYE, H. J., and P. Burrell. *An improved mode of communicating to each of two trains that are in motion the distance they respectively are from each other.* Patent dated June 4, 1855. (No. 1270.)

This invention "consists in the application of electro-magnetism to the raising or otherwise moving, by means of a train in motion, of a succession of rods placed on and connected with a line of railway, or a railway station, to a height varying with the distance of the train from the rod raised or otherwise moved, and which height is indexed on the engine."

ELEY, W. *An improvement in the manufacture of detonating caps for fire-arms.* Patent dated June 4, 1855. (No. 1272.)

The object of this invention is so to construct the interior surface of a detonating cap, that when pressed on to a nipple, it shall offer to the passage through the nipple, a flexible water-proof surface, which shall close the orifice sufficiently to prevent the passage of air, water, or moisture to the charge.

MOREWOOD, E., and G. ROGERS. *Improvements in coating sheets of wrought-iron.* Patent dated June 4, 1855. (No. 1273.)

In carrying out this invention the sheets are to be first cleansed by dilute-acid in the ordinary manner, then covered over with some one or more of the following substances in a solved or melted state, viz., turpentine, resins, lac, gums, oil, grease, gelatinous or bituminous matter. Sheets so prepared will be ready to be soldered without being first coated with tin.

GREEN, G. *Improvements in sawing machinery.* Patent dated June 4, 1855. (No. 1274.)

This invention consists in the application of two independent feed motions to a sawing-machine or frame, by means of two ratchet wheels and pinions, one ratchet wheel and pinion being fixed to a hollow shaft, and the other on a shaft which passes through the latter, &c.

NEWTON, W. E. *An improved construction of ships' auger.* (A communication.) Patent dated June 4, 1855. (No. 1275.)

Claim.—Affixing to the end of an auger stock a separate piece to constitute the cutting part, and securing it in position by means of a dovetail notch or notches, and a

screw, with or without a steadying pin as described.

PULS, F. *Improvements in electro-coating iron.* Patent dated June 5, 1855. (No. 1276.)

Claims.—1. "The regulating or modulating of the intensity or quantity of the electric current from the battery proportionately to the surfaces of the iron to be coated, thus causing the zinc to be deposited upon the iron in the smallest possible particles or atoms, thereby securing a perfect adhesion of the zinc to the iron. 2. The employment of sulphate or hydrochlorate of zinc, or double or treble salts of the same, with potash, soda, and ammonia, for the purpose described. 3. The rinsing of the exhausted fluid from the bath in the battery, and that from the battery in the bath."

GEDGE, J. *Improvements in the distribution of motive power.* (A communication.) Patent dated June 5, 1855. (No. 1279.)

The inventor describes a combination of a pneumatic machine with a number of pipes furnished with pistons at their extremities, and a number of cylinders, the parts being so arranged that the motive power which works the pneumatic machine sets in motion all the pistons.

COFFIN, D. N. B., jun. *A new and useful improvement in self-closing stop-cocks.* Patent dated June 5, 1855. (No. 1280.)

Claim.—The application of elastic packing, so that it shall perform the two duties of packing the valve stem and constantly pressing the valve towards its seat.

CURTICE, C. *A new and improved light alarm or burglar annunciator, or apparatus to give alarm when a burglarious attempt is made to enter a room or dwelling.* (A communication.) Patent dated June 5, 1855. (No. 1282.)

The inventor so connects a match holder and a bell-spring with a slide, that the spring of the slide on being set free by the opening of the door, shall not only elevate the match holder, but also set the bell in motion.

BARROWS, T. *Improvements in the treatment of wool.* Patent dated June 5, 1855. (No. 1283.)

This invention consists in the application of nitre or any of its equivalent salts to wool in a warm bath, for the purpose of restoring the wool when it has become changed, as well as for cleansing, softening, and preparing it, so as to better adapt it to receive dyes and be finished into fabrics.

ALLEN, E. *An improved breech-loading fire-arm.* Patent dated June 5, 1855. (No. 1284.)

This invention consists in so combining a rotary or moveable breech and a charge chamber with the barrel of a fire-arm, that the breech shall uncover the passage into the barrel, and the charge-chamber be brought into a position to permit a cartridge to be passed into it and the barrel, when the breech and charge-chamber are rotated in one direction, and that when they are rotated in the opposite direction the breech shall be made to cover the passage into the barrel, and the chamber in conjunction with the barrel, be caused to bend, break, and hold the cartridge, &c.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

METHVEN, D. *Improvements in the manufacture of stoppers for bottles and other vessels.* Application dated May 26, 1855. (No. 1204.)

This invention consists in forming a stopper of a hollow piece of vulcanized India-rubber or cork, which has a cone to enter at the end which passes into the neck of the bottle, this cone being acted upon by a screw and nut.

NEUFFER, G. *An improved mode of producing patterns upon floorcloths and other ornamental coverings for floors, walls, tables, and other surfaces.* Application dated May 26, 1855. (No. 1205.)

This invention mainly consists in laying delible colours upon a surface prepared with coats of a composition of oil and colouring matter, and in varnishing and washing the whole over in a suitable manner.

BELLFORD, A. E. L. *Improved machinery to be used in preparing flax, hemp, and other fibrous matters.* (A communication.) Application dated May 26, 1855. (No. 1208.)

This invention relates to certain machinery for effecting some of the preparatory operations which hemp, flax, and other fibrous materials have to go through before being heckled and combed.

FULLWOOD, B. *Improvements in the purification of mineral, vegetable, and animal matters containing oily, bituminous, resinous, ammoniacal, and aqueous qualities.* Application dated May 28, 1855. (No. 1211.)

This invention relates to the purification of the matters named in the title by certain chemical and mechanical means, in lieu of by distillation.

MORIES, F. DE. *Improvements in obtaining motive power.* Application dated May 28, 1855. (No. 1216.)

This invention consists "in alternately displacing gravity which is called into action by human, horse, or animal power, or any attraction or impulsion whatever."!

BELLFORD, A. E. L. *Improvements in*

sewing machines. Application dated May 28, 1855. (No. 1217.)

This invention consists of a looper of a novel kind, operating in combination with a needle to form a stitch with a single thread; in a certain method of operating the needle in connection with the aforesaid looper to throw the thread over its point; &c.

SALT, T. P. *Improvements in the construction of artificial legs.* Application dated May 28, 1855. (No. 1220.)

This invention consists in substituting for the mechanism employed for obtaining the movements in an artificial leg, a cord of vulcanized India-rubber or other equivalent elastic material, which is secured to certain fixed points, and passes over friction rollers under the knee and at the instep.

CLOWES, E. *An improved construction of spring for resisting sudden and continuous pressure.* (A communication.) Application dated May 29, 1855. (No. 1227.)

This invention consists in the employment of a spring composed of several plates of steel, bent to the form of a bow, and placed together loosely in pairs, their ends being confined in suitable guides which sufficiently expose the spring to permit of any broken or defective plates being replaced easily.

JOHNSON, J. H. *Improvements in casting metals.* (A communication.) Application dated May 29, 1855. (No. 1232.)

These improvements consist in the employment of a circular chill or mould fitted into the end of a shaft working either horizontally or vertically in suitable bearings, and rotated at a high velocity by gearing or driving pulleys.

JOHNSON, J. H. *Improvements in stamping and embossing presses.* (A communication.) Application dated May 29, 1855. (No. 1233.)

These improvements consist in the employment of any required number of different stamps fitted to work vertically in the overhanging extremity of the curved bracket or arm of an embossing or stamping press, such stamps being individually brought in contact with the object to be stamped by a lever handle working on a swivel or pivot centre in the top of the bracket, so that it may be moved laterally in order to be brought into any one of the stamps desired.

M'LOW, T. *Improvements in screw-propellers.* Application dated May 29, 1855. (No. 1234.)

This invention relates to a mode of forming the blades of screw-propellers, the object of which is to prevent the water from spreading out at right angles or radiating from the propeller shaft by the centrifugal action of the blades.

AKED, R. D. *Improvements in the construction of stands for supporting crochet reels when in use.* Application dated May 30, 1855. (No. 1235.)

These improvements consist in a mode of supporting the reel in the stand so as to reduce the friction of the parts upon which the reel turns when in use, and thus to enable the material to be drawn therefrom freely at all times, instead of by jerks as heretofore.

WHARTON, E. *Improvements in ordnance and fire-arms.* Application dated May 31, 1855. (No. 1237.)

These improvements consist in forming the bore of ordnance of steel, by lining them with a steel tube supported internally, and carried by a loam core concentrically with the centre of the mould, which is placed in a vertical position, the fluid metal being run in at the lower end of it, and flowing up and around the steel tube or cylinder.

WHARTON, E. *Improvements in the machinery for manufacturing metal tubes.* Application dated May 31, 1855. (No. 1238.)

This invention consists of a machine for rolling various-sized tubes of copper, brass, or other alloys with one set of rolls which have but one groove or aperture, &c.

JULLION, J. L. *The manufacture of paper, card, and millboard, from certain vegetable productions.* Application dated May 31, 1855. (No. 1240.)

The inventor proposes to manufacture paper, card, and millboard of the fibres of the banana and plantain, of waste or pressed sugar-canes, and of the various waterflags that abound in warm countries, by dusting the said substances in the machine called a devil, cutting them in a common chaff cutting box, boiling them in a dilute solution of caustic alkali, with or without steam pressure, and bleaching in the usual way with hypochloride of lime.

LEETCH, J. *An improved construction of helmet or head-dress.* Application dated May 30, 1855. (No. 1241.)

The inventor constructs a helmet of a light frame, made of steel-bands or springs so arranged over and about an inner cap of leather or other material as to entirely protect the head from outward violence.

RIMINGTON, W., junior. *A new spring-hinge for swing doors.* Application dated May 31, 1855. (No. 1242.)

The inventor employs levers of the third order, each acting upon a powerful-tempered steel spring. To these levers hooked pieces are connected and placed in opposite directions with respect to each other, embracing a pin fixed into a wrought-iron arm or lever attached to or formed upon the pivot upon which the hinge turns, &c.

LUBBOCK, Sir J. W. *An improvement ap-*

plicable to telescopes and other similar optical instruments. Application dated May 31, 1855. No. 1244.

This invention consists in the application to the object-end of portable telescopes, or other similar optical instruments, of a reflector consisting of a mirror or a prism, so that the object to be viewed may be received thereon at right-angles to the axis of the telescope.

SACHS, H. *An improved construction of fountain-pen.* Application dated May 31, 1855. (No. 1245.)

This invention consists in making the stem of the pen-holder a reservoir for ink. The top is closed with an adjustable cap, which, when raised, will admit to the reservoir air which will force the ink out at the other end.

JACKSON, A., E. KERSHAW, and J. ROBERTS. *Improvements in looms for weaving.* Application dated June 1, 1855. (No. 1251.)

This invention consists in producing the operations of picking and shedding by a sun and planet motion; and in obtaining a positive delivery motion by means of a ratchet wheel giving a surface traversing motion, &c.

TAYLOR, J., and W. SMITH. *Improvements in the chairs of railways.* Application dated June 2, 1855. (No. 1260.)

This invention consists in making a joint and middle chair with one jaw, and fixing, in the place of the ordinary wood key, a loose piece of iron by means of bolts or cotters; also in making a chair in two parts, with a jaw on each part, the joint of the two parts pressing transversely under the rail, both pieces being bolted together at each end.

COE, C. *Improvements in the mode or method of manufacturing druggets, bockings, pilot cloths, blankets, or similar strong materials.* (A communication.) Application dated June 2, 1855. (No. 1261.)

The inventor proposes to use an extra floating warp of cotton or similar material, and confine it to the centre or interior of the goods above mentioned, still preserving a woollen face on both sides.

GALANTE, H. *An improved surgical injection-bottle.* Application dated June 2, 1855. (No. 1265.)

This invention consists of an injection-bottle formed of an elastic or other material, and of such a shape as to stand upright when placed on a flat surface.

DORE, J. T. *An improved mode of constructing boxes or cases for holding needles, buttons, and other wares.* Application dated June 2, 1855. (No. 1266.)

The object of this invention is to construct the above-named boxes in such manner that packets of any particular article may be kept together, and presented at the upper part of the box, ready to be removed when required.

STAITE, M. *The manufacture of a new black paint.* Application dated June 4, 1855. (No. 1267.)

The inventor crushes carbon by means of hammers and rollers, and grinds it by means of stones, and then takes the dust and passes it through sieves (of about 3,000 holes to an inch), or subjects it to successive washings in large tubs. When a sufficiently fine dust or sediment is procured, he mixes it with linseed oil, in the proportion of about 6 gallons to a ton, and regrinds it to a fine soluble paste.

PROVISIONAL PROTECTIONS.

Dated November 9, 1855.

2520. John Olive and William Olive, of Woolfold, near Bury, Lancaster, railway-carriage builders. Improvements in the manufacture of wheels for railway and other purposes.

Dated November 17, 1855.

2596. Joseph Shaw, of New King-street, Hull, Yorkshire. Improvements in the prevention of accidents arising from collisions on railways.

Dated November 23, 1855.

2643. John Henry Hutchinson, of East Retford, Nottingham, gentleman. Improved machinery for converting rectilinear motion into rotary motion.

2645. John Jobson, of Litchurch, Derby, iron-founder. Improvements in the manufacture of railway-chairs.

Dated November 24, 1855.

2649. Jean Lobstein, of Paris, Rue de l'Echiquier, mechanical draughtsman. Improvements in sewing-machines.

2651. Robert Knowles, of Chorlton-upon-Medlock, Lancaster, mechanic. Improvements in winding on in certain machines for spinning cotton and other fibrous materials.

2653. Charles Sanderson, of Sheffield, York, merchant. An improvement in the manufacture of iron.

Dated November 26, 1855.

2655. Louis Joseph Frédéric Margueritte, chemist, of Paris, France. Improvements in precipitating certain salts.

2657. John Wilkes, of Birmingham, Warwick, manufacturer. An improvement or improvements in the manufacture of tubes of copper and alloys of copper.

2659. François Coignet, of Rue Hauteville, Paris, France. Certain improvements in the use and preparation of plastic materials or compositions to be used as artificial stone, or as concrete or cement for building and other purposes.

2661. Frederick Osbourn, of Aldersgate-street, London, tailor. Improved machinery for pressing, smoothing, or finishing garments or parts of garments.

2663. John Julius Clero de Clerville, of Newman-street, Oxford-street, Middlesex. Improvements in preparing oil with other matters for painting. A communication from Felix Abate, of Paris.

2665. Robert Bell, of Glassford-street, Glasgow. Improvements in the manufacture of woven fa-

brics when made of wool and cotton, or of wool, cotton, and silk.

Dated November 27, 1855.

2667. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in breech-loading fire-arms. A communication.

2669. Hiram Hyde, of Truro, Nova Scotia, gentleman. An improved manufacture of lubricating oil. A communication.

2671. Charles Rice, of Massachusetts, United States. A new or improved method of manufacturing boots or shoes. A communication from Henry G. Tyer and John Helm, of New Jersey, United States.

2673. Charles Rice, of Massachusetts, United States. A new or improved process of preparing cloth so as to render it nearly, if not entirely, impervious to water, but not so to air, such cloth being particularly useful in the manufacture of boots and shoes, or various other articles of dress or utility. A communication from Henry G. Tyer and John Helm, of New Jersey, United States.

2675. George Louis Stott, of St. George's, Gloucester. Improvements in the manufacture of carbonate of soda.

2677. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in windlasses, capstans, and other purchases, parts of which are applicable to the transmission of motive power. A communication from Louis Frederic François David, of Havre, France, chain manufacturer.

2679. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture or preparation of India-rubber and gutta percha, and in the applications thereof. A communication from Henri Victor Wacrenier, of Paris, France.

2681. George Richardson, of Craig's-court, Charing-cross, Middlesex, merchant and contractor for railway plant and stores. Improvements in chain cables and other chains. A communication.

Dated December 14, 1855.

2824. William Philippi, of Regent-street, Middlesex. Improvements in coating iron with tin.

2826. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Surrey. Improvements in machinery for the manufacture of cut pile fabrics. A communication.

2828. Edward Orange Wildman Whitehouse, of Brighton, Sussex, surgeon. Improvements in apparatus for measuring fluids.

Dated December 15, 1855.

2830. William Henry Newman, of Cannon-street-road, Middlesex, corn-dealer. An improved fire-lighter.

2832. Thomas Warren, of Glasgow, Lanark, glass-manufacturer. Improvements in the manufacture and moulding or shaping of glass.

2834. Edward Brown Hutchinson, of Moorgate-street, London, artist. An improved apparatus for forming and cutting elliptical figures.

2840. Samuel Stewart, of Clement's-lane, London, consulting engineer. An improved combined engine and gas exhauster, and also improvements in the valves of such exhausters.

2842. Paul Marie Salomon, of Rue Neuve, St. Eustache, Jacques Loir Montgazan, of Rue de Bondy, and Charles Marie Joseph de Flers, of Rue Lafitte, Paris, France. Improvements in the manufacture of gas from coals, and in the production of bituminous coke in that manufacture, and also in the apparatus connected therewith.

Dated September 17, 1855.

2844. George Collier and John Crossley, both of Halifax, York, and James William Crossley, of Brighouse, Halifax. Improvements in apparatus employed in drying and stretching woven fabrics.

2846. Henry Stewart, of Baker-street, Middlesex, gentleman. A machine or apparatus for cleaning and polishing forks, spoons, and other like curved articles.

2848. Omrod Coffeen Evans, doctor of medicine, of New York, United States. Improvements in digging-machinery.

2850. George Gotts Golding, at Messrs. W. Cubitts and Co's., Gray's-inn-road, London. Improvements in boilers for heating, warming, or raising steam.

2852. James Leitch, sugar-refiner, Ellenborough-street, Liverpool, Lancaster. Improvements in filtering sugars and other saccharine matters.

2854. Jean Jacques Fontaine, of Paris. Improvements in the manufacture of steel.

2856. Andrew Small, of Glasgow, Lanark, ship-chandler. Improvements in marine compasses, and in apparatus applicable thereto.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2880. Dundas Smith Porteous, of Paisley, Renfrew, Scotland. Regulating the pressure of gas, steam, water, or other fluids. December 20, 1855.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January* 1*st*, 1856.)

1860. Frederick Paget. An improved holder for steel or other pens by which ink is supplied to them. A communication.

1895. Edward Field. Improvements in presses or machinery for embossing and colouring.

1897. Dupont de Bussac. The combination of hydriodic acid, watery or oily, or salts of iodine with tannic acid, the constituting parts of cinchona or of sarsaparilla, or of the leaves of the walnut-tree and iron, or with one or several of these bodies.

1901. Jacob J. Lownds. An improved extension pen and pencil-case.

1903. Jules Théodore Alexandre Zinkernagel. Improvements in the manufacture of mosaic-work.

1906. Charles Claus. Improvements in removing hairs from hides and skins.

1907. Victor Fouchier. Improvements in constructing and preparing mill-stones.

1929. Eugene Carless. Improvements in the manufacture of artificial leather, suitable for book-binding and other purposes.

1930. Adam Hall Hardy and Jacob Hardy Fordoff. A compound pill and ointment for the cure of scorbutic and similar disorders of the human body.

1937. Emile Constantin Fritz Sautelet. An improved impermeable cloth or fabric for sheltering, covering, and preserving in various purposes.

1938. James Smith. Improvements in children's carriages or perambulators and invalid carriages.

1945. Auguste Edouard Loradoux Bellford. Improvements in percussion-guns. A communication.

1966. Rudolph Schramm. A new process for treating cotton-seed for the purpose of and previous to the obtaining of oil from it. A communication.

1968. George Frederick Rose. Certain improvements in lithographic and copperplate printing-presses.

1987. Edouard Sy. A new method of obtaining motive power.

2006. James Henry Bull. Improvements in fountain-inkstands.

2120. John Palmer. Improvements in the construction of reaping-machines.
2283. William Lyall. Improvements in spinning machinery, applicable also to roving machinery.
2339. John Talbot Pitman. An improvement in fire-arms. A communication.
2491. Joseph Schloss. A new mounting for travelling-bags.
2512. Henry John Betjemann. Improvements in expanding or extending tables. Partly a communication.
2520. John Olive and William Olive. Improvements in the manufacture of wheels for railway and other purposes.
2645. John Jobson. Improvements in the manufacture of railway-chairs.
2664. James Clark. Improvements in the chain-wheels used on capstans, windlasses, and other axes.
2667. William Edward Newton. Improvements in breech-loading fire-arms. A communication.
2669. Hiram Hyde. An improved manufacture of lubricating oil. A communication.
2671. Charles Rice. A new or improved method of manufacturing boots or shoes. A communication.
2673. Charles Rice. A new or improved process of preparing cloth so as to render it nearly, if not entirely impervious to water, but not so as to air, such cloth being particularly useful in the manufacture of boots and shoes, or various articles of dress or utility. A communication.
2674. Samuel Amos Kirby. Improvements in open stoves and grates for rooms and apartments.
2736. William Beatson. Improvements in treating borates of lime and magnesia, and a new composition formed therewith, suitable for glazing and other purposes for which borax has been or may be employed.
2747. Ebenezer Poulson. A new constructed engine to be worked either by steam or principally by manual labour.
2802. Alexandre Forot. Improvements in parasols.
2812. Thomas Rickett. Improvements in pressure-gauges.
2826. George Tomlinson Bousfield. Improvements in machinery for the manufacture of cut pile fabrics. A communication.
2832. Thomas Warren. Improvements in the manufacture and moulding or shaping of glass.
2835. Ebenezer Rogers. Improvements in safety-doors for mines.
2880. Dundas Smith Porteous. Regulating the pressure of gas, steam, water, or other fluids.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1852.
1149. Jean Louis David.
1172. John Mason.
1174. William Beckett Johnson.
1185. Francis Alton Calvert.
1197. Auguste Edouard Loradoux Bellford.
1202. James Ward and William Burman.

1853.
9. Matthew Tomlinson.

LIST OF SEALED PATENTS.

Sealed December 21, 1855.

1471. Henry Walker.
1473. Charles Moreau-Darluc.
1483. Edward Joseph Hughes.
1484. Jean Baptiste de Lorenzi.
1491. Thomas Barling.
1510. Joshua Horton and Thomas Horton.
1518. Anguish Honour Augustus Durant.
1530. Richard Roberts and George Coppock.
1549. Edmund Hart.
1586. Thomas Sadleir.
1628. Piétro Bertinetti.
1685. George Tomlinson Bousfield.
2079. William Frederick Thomas.
2117. John Henry Linsey.
2151. Henry Hughes.
2245. John Henry Johnson.
2253. James Murdoch.
2324. William Henry Walton.
2366. Alfred Gregory and John Jillings.
2394. Frederick Crace Calvert.

Sealed December 28, 1855.

1479. John Skelley.
1485. Henri Dembinski.
1487. John Broadbent and Stanley Peter Youle.
1489. John Weems.
1493. John Birch.
1499. Robert Muckelt.
1509. Samuel Oddy.
1515. James Bullough, Robert Willan, and John Walmsley.
1520. James Beckett and William Seed.
1522. John Gedge.
1539. James Palmer.
1555. Charles Frederick Bielefeld.
1559. John Bethell.
1585. Francis Hamilton.
1598. Pierre Laroche.
1613. Charles Toye.
1615. Thomas Trapp.
1629. David Fisken and Thomas Robert Hay Fisken.
1633. John Henry Johnson.
1634. John Henry Johnson.
1635. John Henry Johnson.
1642. John Henry Johnson.
1658. James Tildesley.
1729. William Fletcher Coles.
1734. Herbert Mackworth.
1827. Walter Brown.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

Mr. Mushet writes as follows:—"In the grand summary which winds up last week at once the projectile controversy and the old year, I was struck with the thrice-repeated assertion, that I had been the largest and most voluminous of the controversialists. I was aware of taking great interest in the discussion, and did propose, when the smoke of declamation had cleared away, and the adversaries commenced to write *to* and not *from* the subject, to have offered something on the points I promised. I remembered I had given a puff or two to aid the clearance of the atmosphere, but believing I had been more a looker-on than a legion, I was induced to refer back, and have extracted from your numbers the following statistics of the four most voluminous combatants,—a regular *crescendo*:—'Mechanic'—3 letters, $7\frac{2}{3}$ columns. Mushet—4 do., $8\frac{1}{21}$ do. Hopkins—6 do., $12\frac{5}{8}$ do. 'W.'—7 do., $38\frac{1}{2}$ do.

"I do not doubt that faith, as you state, may sometimes be the one thing needful in philosophy; yet, as fact is not always to be despised, I beg to be obliged by the insertion of these figures, which will involve no controversy. I may, perhaps, add my surprise at hearing that the massy breadth of Mr. Hopkins's weighty, exact, and instructive style is not generally approved."

The following is our reply to these remarks of Mr. Mushet: 1. In our article on the "Projectile Controversy," published in our last Number, there is no "thrice-repeated assertion" that he "had been the largest and most voluminous of the controversialists." It is true that in the conclusion of the last paragraph but one, we refer to Mr. Mushet as having written "most voluminously" in the dispute; but by this we merely meant "very voluminously" 2. Mr. Hopkins's style may possess "massy breadth," for anything we know to the contrary: but we affirm again, that it is frequently neither exact nor instructive, but "very loose, both in argument and language," as we have before stated, and as we shall probably have further occasion to show shortly.

T. T. Wilkinson.—Your communication has been duly received, and will very soon appear.

C.—Your numerous letters, which require a rather long answer, shall receive it shortly.

CONTENTS OF THIS NUMBER.

Captain Ericsson's New Air Engine (*with engravings*) 1
Faraday's Experimental Researches in Electricity 5
Institution of Civil Engineers, Annual General Meeting 9
Silvester's Spring Balances (*with engravings*)... 10
Photographs of the Sun's Disc 11
A Manual of Photographic Chemistry. By T. Frederick Hardwick 12
On Permanent Ways 12
Steam Boiler Explosions 13
Design for a Funeral Carriage (*with engravings*) 14

Specifications of Patents recently Filed:

Rabatte ....Making Leather 15
Avery........Transporting Weights... 15
Botta ....Furnaces........ 15
Waterhouse ....Forge Hammers 15
Howell ....Furnaces........ 15
Rowlands ....Gas 15
Swinton........Grinding-carts 15
Morrison ....Railways........ 15
Roch ....Advertising 15
Leese ....Colouring Matter 15
Whitehead and Whitehead ......Woven Fabrics 15
Grafton ....Cooking Apparatus 16
Coleman........Land Rollers 16
Dunn ....Steam Boilers 16
Acklin ....Looms 16
Lafond and Chatauvillard ....Obtaining Oils, &c. 16
Payne........Covered Thread........ 16
Langshaw and Jelley ....Fancy Fabrics 16
Lee ....Steam Boilers 16
Rogers ....Bottle Stoppers........ 16
Henry........Vices 16
Newton ....Calculating Apparatus .. 16
Wharton ....Steam Engines 16
Dunlop ....Chlorine 17
Bickerton ....Lubricators........ 17
Cologne ....Diving Apparatus........ 17
Ashworth & Stott..Fibrous Substances...... 17
Worsdell ....Lifting Jacks........ 17
Brooman ....Dyeing Threads 17
Fontainemoreau ...Oils 17
Peyton & Stocker..Bedsteads 17
Venant ....Roasting Coffee........ 17
Pellenz ....Iron Wheels 17
Whytock ....Colouring Threads 17
Spencer ....Twisting Threads........ 17
Boyd ....Printing Machines 18
Lane and Taylor...Steam Engines 18
Little ....Envelopes 18
Cartwright ....Steam Cock 18
Armelin........Ploughs 18
Godefroy ....Gutta Percha........ 18
Kaye and Burrell..Railway Signals 18
Eley ....Caps for Fire-arms 18
Morewood and Rogers ....Coating Iron Sheets...... 18
Green........Sawing Machinery 18
Newton........Augers 18
Puls ....Coating Iron 19
Gedge........Distributing Power 19
Coffin ....Stop-cocks 19
Curtice ....House Alarums........ 19
Barrows........Wool 19
Allen ....Fire-arms 19

Provisional Specifications not Proceeded with:

Methven ....Bottle Stoppers 19
Neuffer ....Producing Patterns...... 19
Bellford........Fibrous Substances 19
Fullwood ....Oily Matters 19
Mories ....Motive Power 19
Bellford........Sewing Machines........ 19
Salt........Artificial Legs 20
Clowes ....Pressure Springs 20
Johnson........Casting Metals 20
Johnson........Stamping Presses........ 20
M'Low ....Screw Propellers 20
Aked ....Stands for Crochet Reels 20
Wharton ....Ordnance 20
Wharton ....Metal Tubes........ 20
Jullion ....Paper, Card, &c. 20
Leetch ....Helmets........ 20
Rimington ....Swing Doors........ 20
Lubbock ....Telescopes 20
Sachs........Fountain Pens........ 21
Jackson, Kershaw, and Roberts......Looms 21
Taylor and Smith..Railway Chairs 21
Coe ....Druggets, &c. 21
Galante........Injection Bottle 21
Dore ....Needle Boxes 21
Staite........Black Paint 21

Provisional Protections 21
Patent Applied for with Complete Specification 22
Notices of Intention to Proceed........ 22
Patents on which the Third Year's Stamp Duty has been Paid 23
List of Sealed Patents 23
Notices to Correspondents 24

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1692.] SATURDAY, JANUARY 12, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

WHITWORTH'S IMPROVEMENTS IN ORDNANCE, FIRE-ARMS, PROJECTILES, AND MACHINERY FOR MANUFACTURING THE SAME.

Fig. 3. Fig. 1. Fig. 2.

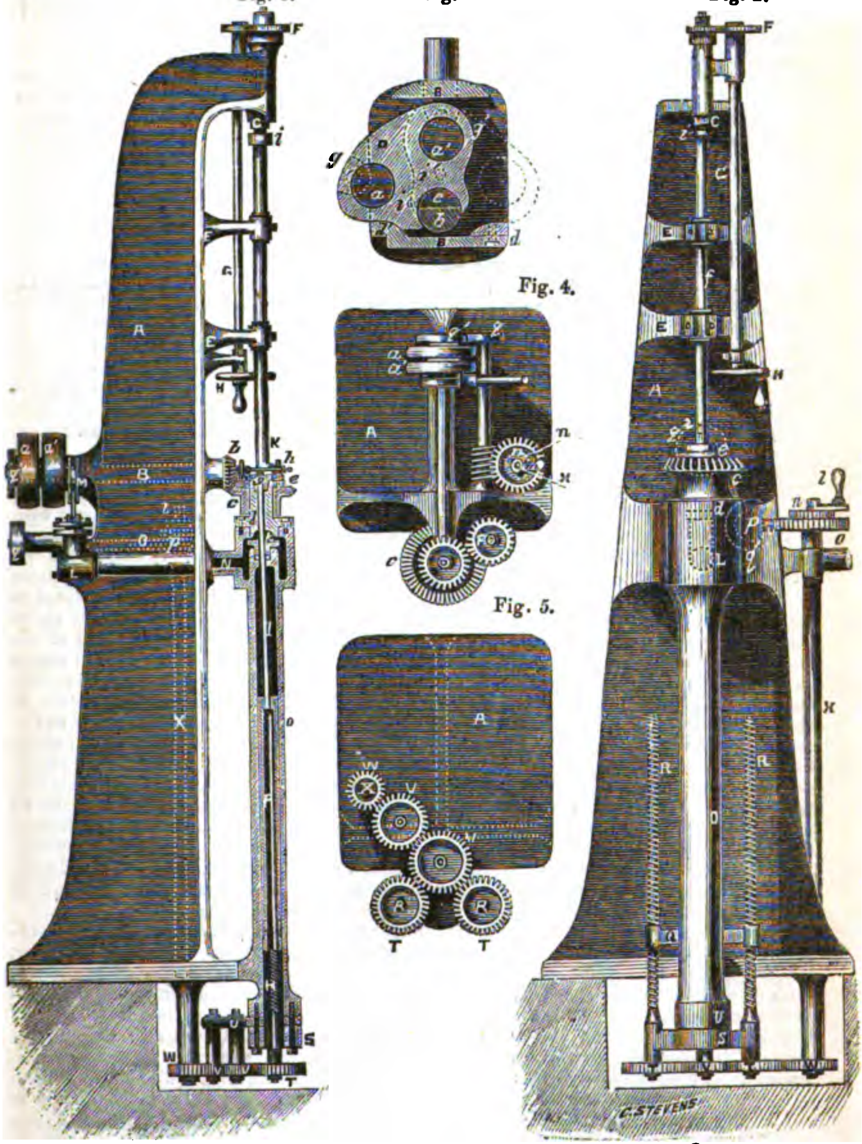


Fig. 4. Fig. 5.

WHITWORTH'S IMPROVEMENTS IN ORDNANCE, FIRE-ARMS, PROJECTILES, AND MACHINERY FOR MANUFACTURING THE SAME.

HAVING already laid before our readers a full description of Mr. J. Whitworth's improvements in ordnance, &c., patented December 1, 1854,* we now bring to their notice the subsequent invention of that gentleman, patented on the 23rd of April, 1855.

The first part of this invention relates to improvements in breech-loading apparatus, and consists in the application to fire-arms of a moveable breech piece oscillating upon a joint pin, and having two chambers, which, by a reciprocating action, can be alternately moved by hand opposite the barrel. A transverse section of this arrangement is shown in fig. 1 of the engravings on the preceding page. The barrel has screwed on at the breech end the metal frame or breech holder, B, which is also attached to the stock. In the breech holder, B, is placed the breech, D, having two chambers, *a*, *a'*, to receive the cartridge or charge. It is made to oscillate upon the pin, *b*, so as to bring one of the two chambers opposite the end of the barrel, the other projecting at the side of the barrel so as to be charged, a portion of the stock being cut away for that purpose. In fig. 1, the double-chambered breech, D, is shown in its two positions in full and dotted lines. The breech holder, B, has two projections, *d* and *d'*, for the double-chambered breech, D, to abut against. The projection, *d*, turns upon a pin quarter round to allow the double-chambered breech to be removed for cleaning, or when it is desirable to employ two or more of such breech pieces for rapid firing, the arrangement affords the facility of readily changing the breech pieces. To admit of this, the joint pin, *b*, has one flat side, *e*, and the cylindrical hole through the double-chambered breech, D, has a segment cut away. The double-chambered breech, D, is adjustable longitudinally by an incline and screws, so as to remove the play between it and the end of the barrel. The lock and trigger of the gun being of ordinary construction are not shown. The hammer is placed in the centre of the lock instead of at the side, an opening being cut in the breech holder, B, to receive it, and it acts alternately upon the nipples, *g*, *g'*, as they are brought under it. To retain the double-chambered breech piece in suitable positions for firing, a pin is attached to and worked by the hammer, which at the time of discharge inserts a pin in one of the holes, *i*, *i'*, on the double-chambered breech piece, D, corresponding to the chambers, *a*, *a'*.

The second part of this invention relates to an improved projectile, which is made of such a shape that the bearing surfaces of the projectile shall exactly correspond to and fit the internal surface of the barrel for which it is intended, so that if the barrel have a bore of a spiral polygonal shape, as much of the projectile as bears upon the inside of the barrel has also a spiral polygonal shape, the ends of the projectile being of the ordinary form. In this system it will be seen that the projectile bears a similar relation to the barrel which an ordinary moveable screw does to a fixed nut. This projectile is peculiarly well adapted to the improved fire-arms and ordnance described in the specification of the patent above mentioned, dated December 1, 1855, the sectional outline of which is a polygon of the same number of sides as the barrel, and the longitudinal lines have the same spiral course as the rifled interior of the barrel. The rear end of the projectile may be made flat, hollow, or, if desirable, of any other shape. The front end is conically shaped, similar to ordinary elongated shot. When the projectiles are made up into cartridges the rear end of the projectile should be cut away or shouldered down, so as to leave a shoulder to which the casing may be attached. By making the barrel and projectile of corresponding shape, as above described, Mr. Whitworth is enabled to use a harder metal or combination of metals for the projectiles, and the projectile will be propelled to a greater distance by making a mechanical fit in the first instance, and employing the powder to propel instead of expending it to compress the ball into the grooves of a rifled barrel. He does not confine himself to any particular apparatus or machine to obtain the peculiar form, but prefers to cast the projectile of an approximate shape in suitable moulds, and to press it into or cut it to the exact shape, either by dies in an ordinary fly press, or by other apparatus.

The third part of the invention relates to lathes for turning the barrels of guns and ordnance, and consists in the application of two cutting tools, one placed opposite to the other, in combination with a traversing concentric stay, by which means a greater quantity of work may be done in a given time, and of a superior quality, as the forces are balanced and the lateral pressure on the barrel under operation is considerably reduced.

The fourth part of the invention relates to machinery and apparatus for shaping the inside of gun barrels and ordnance, and consists in the employment of a tension bar supported at both ends, having cutters or grinders placed in the middle, to which tensile force is applied for the purpose of diminishing deflection in the bar, whilst the operation of

---

* See *Mech. Mag.*, vol. lxiii., p. 152, No. 1671.

rifling or grinding is going on. Also in the combination of a dividing motion with the rectilinear and rotary motions, by which the cutter is made to take a succession of light cuts down each groove in turn, instead of each groove being finished before commencing another, as heretofore.

The fifth part of the invention relates to improved apparatus for drilling or boring gun barrels vertically, in which the drill cutter is made of thin steel, and is placed crosswise at the top of a tube, the exterior of which is grooved from end to end. The lubricant is forced by a pump or other means along the grooves, and the cuttings fall down the interior of the tube, and make their escape below, the barrel being for this purpose placed above the drilling apparatus. Fig. 2 represents a front elevation of this apparatus; fig. 3, a side elevation; fig. 4, a plan from above; and fig. 5, a partial plan from underneath. A is the main frame; B, the driving shaft, having on one end the fast and loose pulleys, *a*, *a'*, and at the other a bevil wheel, *b*, gearing into the bevil wheel, *c*; the latter runs freely on the bossed plate, *d*, and has a driver plate, *e*, screwed to it, with two studs projecting upwards. *f* is the gun barrel, inserted at its lower end into the cup or hollow centre, *g*, and having a carrier, *h*, screwed to it, which runs in contact with the studs. At the upper end of the barrel is a second hollow centre, *i*, brought against it by the cylinder and screw, C, D. E, E are two stays for supporting the barrel and preventing deflection whilst being bored. The spur wheels, F, and vertical shaft, G, serve to bring the handle wheel, H, to a convenient height from the ground. I is the drill tube, which has a hole through it, and at its upper end across the centre is fixed a bridge-formed cutter, K; the exterior of the tube, I, has two grooves cut in it extending from the plain part to the cutter, along which grooves the oil or other lubricant is forced, whilst the cuttings removed from the barrel are carried by their own gravity down the inside of the tube. L is an ordinary force pump, worked by an eccentric, M, on the driving shaft, B. The lubricant is supplied from a cistern (not shown), and passes from the pump, L, into the receiver, N, from which it has no mode of issue except along the grooves, and is prevented from returning by the gland, *k*; the part, O, of the main frame is bored to receive the cylinder, P, in which the drill tube, I, is inserted and secured by a set screw or pin. The cylinder, P, has likewise a hole through it, so as not to obstruct the passage of the cuttings as they fall down, and on its lower end is fixed a cross arm, Q, at the extremity of which are two screwed holes to receive the screws, R, R; at S is a bearing plate supporting the screws, R, R, and the spur wheels, T, T, keyed on to them. At U is another plate supporting the two carrier wheels, V, V, in gear with the wheels, T, T, and with the driver wheel, W, which latter is keyed on the bottom of the vertical shaft, X. At the top of the vertical shaft is fastened the handle, *l*, on which is a catch, *m*, taking into the ratchet wheel, *n*. *o* is a worm wheel, in which the worm, *p*, works, and is driven by the pulley, *q*, from the pulley, *q'*, on the first driving shaft, B. The gun barrel (which is formed out of a solid cylindrical bar of iron) has the carrier, *h*, screwed on its end, and it is then put into its place in the lower hollow centre, *g*, and the upper hollow centre, *i*, is brought into contact with it by the handle wheel, H. Rotary motion being communicated to the machine by a strap applied to the fast pulley, *a*, it is imparted to the gun barrel by the means described, and the drill is pressed upwards by the screws, R, R; at the same time the pump, L, forces a quantity of oil or other fluid sufficient to lubricate the cutter, which, with the cuttings, descends as before described. When the boring of the barrel is completed, the catch is detached from the wheel, *n*, and the tube and drill may then be lowered by the handle, *l*. The top hollow centre is then raised, and the barrel taken out of the machine for another to be inserted.

The sixth part of the invention relates to machinery and apparatus for drilling and boring the barrels of guns and ordnance when in a horizontal position, and consists in the employment of a drill at each end of the barrel at the same time, so as to effect a saving of time, and to produce a bore with great accuracy (each drill being only half the length of that used for drilling the whole length of the barrel.)

NOTÆ MATHEMATICÆ.

(By T. T. Wilkinson, F.R.A.S.; Member of the Manchester Philosophical Society; of the Lancashire and Cheshire Historic Society, etc., etc.)

NO. IX

(*Continued from vol. lxiii. p. 223.*)

Amongst the most important of the series of papers left unfinished by the late Professor Davies, may be reckoned the "Geometrical Notes" published in this Magazine. Had he been spared a little longer, we should have been put in possession of the results at which he had arrived respecting the fundamentals of geometry,

founded upon a long course of experience, and embracing a searching examination of the excellences and defects of Euclid's Elements, together with a review of the probable state of geometrical science as it existed in the hands of the earlier and later Greek geometers. The hand of Death, however, put a period to his labours after the first portion of the third note had been prepared, and consequently deprived us of "the result of more than thirty years' careful consideration, though only now put down *in their present form* for the first time."

The discussion on the peculiar characteristics of the Elements of Euclid had only just been commenced, and little more had been advanced than what had already appeared in Mr. Potts's excellent edition; but with regard to the knowledge possessed by the Egyptians, he had well nigh completed his investigations, and considered himself entitled to draw the following conclusions:

1. "That the Greeks received geometry from the Egyptians, not as a practical art merely, but as a methodised science; not only composed of constructions, but also of demonstrations.

2. "That the mode of demonstration so received was effected chiefly by superposition, and by the method now known as *reductio ad absurdum.*

3. "That the method of making one truth subservient to the demonstration of another, and the consequent employment of the direct categorical syllogism in effecting the proof, was almost wholly, if not entirely, due to the Greeks.

4. "That the Greek geometry loses something of its beauty from the rejection of the logic of Aristotle, by the disciples of Plato.

5. "That though there is an obvious desire manifested throughout the Elements of Euclid to dispense with the use of motion, transposition, or successive occupation of space, there is little to justify the belief that the Greeks encouraged a hope of success; whilst almost every page bears witness to Euclid's conviction that he had not accomplished it.

6. "That there can be no *reasoning* in geometry without the assumption of axioms.

7. "That the peculiar evidence attached to geometrical conclusions, arises from these two circumstances, viz., the nature of the copula in the argument, and the *absolute identity* of the middle term in both the premises of its syllogism.

8. "That the term *mechanical* is absurdly applied when applied to Euclid's method of transposition; and that no system of geometry is within the reach of our faculties which does not admit of this principle." (*Mech. Mag.*, vol. liii., p. 295.)

It will be found on examination, that the chief points of difference between Professor Davies and Mr. Thynne, are more to be attributed to the position from which each has viewed the bearings of the ancient geometry, than from any positive error on either side. The one, most probably, contemplates the whole of what we know respecting the efforts made by the Greek geometers towards the solution of particular problems; the other limits his views to what appears to him to be the structure of the Elements of Euclid. If, however, the *Mathematical Collections of Pappus* are to be taken as a record of the tendencies of the Greek geometry, we must admit that, *as geometry*, the construction of problems formed one of the principal objects of the ancient course of instruction. With the uses of geometry as an instrument of reason, we are not now concerned; we speak of it as geometry merely, and not in connection with its value as the recognized *formal logic* of a thinking age.

When we examine the contents of the *Mathematical Collections*, we find that the *third* book is principally occupied with the solution of four problems, of which the duplication of the cube and the inscription of the five regular solids in a sphere, may be instanced as the most important. The *fourth* book contains the Quadrature of the Circle; the solution of the Delian problem by means of the conchoid; the application of the quadratrix to the solution of various problems; together with a few theorems, linear, plane, and solid, including the curious discussion on the properties of the Arbelon, which, by-the-bye, are in fact nothing more than the relations resulting from the consideration of particular cases of the general problem of tangencies.

The *fifth* book is principally devoted to the consideration of isoperimetrical problems and the structure of the cells of bees; whilst the *sixth* book contains most of what was then known on the doctrine of the sphere. In the *seventh* book we find a collection of all the lemmata necessary for the solution of all the great problems of antiquity, and we may surmise that Professor Davies probably had these in mind when he referred to the taste for problem-solving amongst the ancients, rather than those which now form what is usually termed *practical geometry.* We have here no fewer than two hundred and thirty-eight preparatory lemmas for the solution of the *problems* of the Section of Ratio, the Section of Space, the Determinate Section, the Inclinations, the Tangencies, the Plane Loci, the Porisms, the Conic Section, and the *Locis ad Superficiem*; most of which appear to have formed *the end and aim* of a full

course of geometrical instruction in the times and nations to which we now refer.

With regard to the Elements of Euclid, it may be urged that their composition does not indicate that their author had any clearly-expressed intentions of composing a strictly logical treatise on the subject of geometry. Had he entertained any such ideas, we should have expected to find him commencing his propositions agreeably to the order of his definitions—in fact, with a discussion of points, lines, &c., before entering upon the consideration of triangles; and with the full enumeration of all the relations existing amongst the more simple plane figures before entering upon those which are more complex. But when we reflect that the properties of *points* cannot be made manifest without the assistance of the segments of the lines upon which they occur, and that the properties of *lines* cannot be explained in a geometrical system separately from the rectangles, &c., constructed upon them, we are compelled to fall back in a great measure upon the course pursued by Euclid; and although we may perhaps in some respects improve the detail of his Elements, we are obliged to allow their structure to remain untouched in all its essential particulars.

That their object is mostly *theoretic* may be admitted without demur, for we need go no further than the *fourth* proposition in the first book to be convinced of the fact. In the first and second propositions we are taught how to construct and make use of an equilateral triangle; but here we are called upon to accept evidence of the properties of all triangles whatever, without having been furnished with any information as to the mode of constructing any but the most simple kind. All we have therefore to do is, to *conceive* such figures to exist—to *theorize* on their properties when they have been constructed somehow or other—and to wait until we arrive at the twenty-second proposition, when we are at once put in possession both of the process and its limitations. In a similar manner we are taught the properties of quadrilaterals, in Propositions 33 to 41, before we meet with a case of construction; and hence we may question the correctness of that view of the Elements which requires that we be taught *how* to construct a figure before we begin to reason upon its properties. We are certainly shown how to construct a square before we attack the *forty-seventh*, but this is not always the practice followed by the author of the Elements.

It is again open to question whether it was possible for the Platonic theory of atoms to depreciate to any great extent the purity of the Pythagorean geometry. A string of atoms in the form of a right line is certainly conceivable, but it would by no means come up to the vigour of Euclid's ideal. All atoms, however small, are necessarily material particles, having length, breadth, and depth; and lines composed of such solid, indivisible substances could scarcely be seriously substituted for Euclid's "length, without breadth or thickness," even in the most corrupt stages of geometrical decadence. When pushed to consequences, right lines would have to be expressed by *whole numbers* of atoms only;—triangles, quadrilaterals, &c., would have to be constructed from such wholes, and the doctrine of fractions and incommensurables would have to be relinquished. The atomist might indeed get over the axiom of equality in the case of right lines; but what would he be able to say of portions of space generally? With lines of given lengths he might in certain cases be able to construct triangles or other figures; but he could seldom be certain that they would enclose a whole number of atoms, neither more nor fewer. Under such circumstances, the progress of the atomist would be very limited, and he would ultimately be compelled to abandon the application of his theory to the elements of geometry, and seek a more congenial field in speculating on the atomic properties and composition of matter.

Considerable difference of opinion appears to exist amongst writers on geometry as to the value and nature of the postulates and axioms prefixed to the Elements. Some contend that they are redundant, inasmuch as they are as essential to chemistry and other sciences as they are to geometry, and may be classed amongst the common notions which we admit without proof from childhood. Others object to them as they stand in Euclid, because they do not square with certain metaphysical notions which they deem essential in all primary truths. We find no ground for supposing that Euclid ever intended to frame a metaphysical system of geometry. He deals only with pure idealities. He conceives perfect points, perfect lines, perfect circles, and then bids us reason upon these by means of the axioms, as if such could really be constructed by means of the postulates. All but two or three of the axioms may indeed belong in common to other sciences, but they are not the less necessary as raw material. It has been well said by Professor Young, that "the *definitions* furnish the raw material worked *upon*, and that the postulates and axioms furnish the implements worked *with*," the former "supplying the elements of the constructions," the latter "the elements of the reasonings." When Euclid states that two lines are

equal, he means that they will each extend the same distance if subjected to *accurate* measurement, and in a similar manner two angles are equal from his point of view, if the openings are equal when properly adjusted. He had probably no notion that a time would come when angles would be proposed to be measured by means of ratios; for if he had, he would probably have taken pains to assure his disciples that such angles had no place in his conceptions of the fundamentals of plane geometry. A true axiom is at the same time both self-*evident* and in*demonstrable*, and hence the *fourth* proposition of the first and the *second* proposition of the third book are denied the place of first principles, since they both lack the second characteristic of Euclid's common notions. When we propose to apply the principle of circles not intersecting more than *twice* to the *eighth* proposition, we obtain a proof at once, without adducing the *seventh* as a preparatory lemma; but we are at the same time obliged to presuppose the construction of a triangle and its limitations, which by Euclid's system are denied us until we have digested more than a dozen intermediate propositions. Proposition VII. may be almost useless as regards its connection with the succeeding portions of the Elements, yet it is not without its advantages in a physical point of view. It teaches us that when the sides of a triangle are "freely moveable about joints at its vertices, it cannot possibly be thrust out of shape by any force whatever."

The *eleventh* axiom is merely a particular application of the *first*; the one expresses an elementary truth in its most general sense, the other limits its application to a particular opening of two or more lines in plane geometry. With a slight modification we might say the same of Axiom VIII; the test of equality being that each contains, or may be conceived to contain, the same number of superficial or solid units respectively.

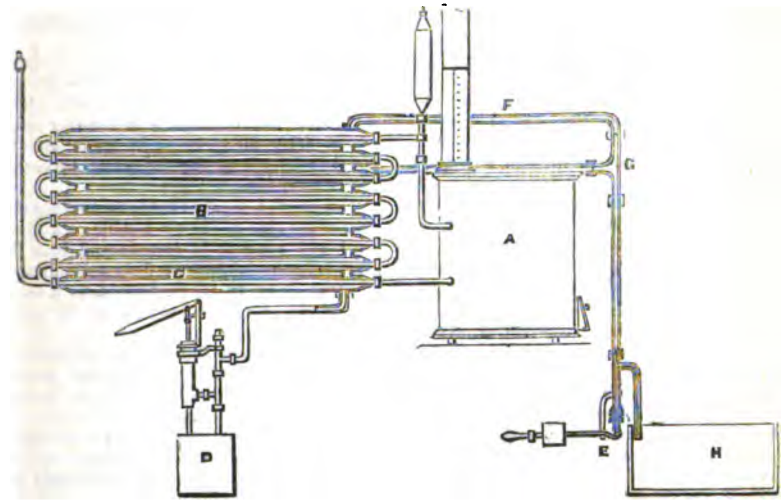
(*To be continued.*)

DR. NORMANDY'S IMPROVEMENTS IN OBTAINING FATTY ACIDS AND SOAPS.

Dr. Normandy has recently introduced several improvements in converting fatty and oily substances into fatty and oily acids and into soap.

The fat, grease, or oil to be converted into fatty acids is first mixed with hot water, so as to form an emulsion, or else it is employed *per se*; but, if necessary, it is first melted by heat. The emulsion of fat or oil with water, or the fluid fat or oil if employed alone, with steam, is then transferred to a reservoir communicating by an iron pipe, provided with a cock, with another iron pipe connected with a steam generator capable of producing steam at a pressure which may be as high as 3,000 lbs. per square inch, "the rapidity of the conversion of the fat or oil into the corresponding fatty acid being, I believe," says Dr. Normandy, "in proportion to the heat to the time during which the said fats or oil are submitted to the treatment, and to the steam pressure employed." The pipe above alluded to is also provided with a cock, placed between the oil pipe of the reservoir and the steam generator; the first serving to regulate the flow of the oil, the other to regulate the issue of the steam. The other end of the pipe connected with the steam generator is left open; or, if plugged, it is provided with a number of small holes round its periphery for a suitable length, or it may be closed by a loaded valve. The method which is adopted will perhaps be better understood by saying, that, supposing a Perkins' steam gun to be procured connected with a steam generator producing steam of a suitable pressure, the fat, grease, or oil previously rendered fluid, if not already so, or the watery emulsion of the said fats, oils, or grease, is intended to trickle down from a reservoir by means of cocks or valves into the gun barrel or pipe, so that they may be first exposed to the contact of the steam for a greater or shorter length of time, and then shot, or violently forced out into a reservoir, by admitting the steam into the barrel or pipe (after the said fats or their emulsions have flowed into it in convenient or proper quantity), either intermittently or in a continuous stream; and instead of allowing the emulsion, or the mixture of oil or fat and steam, to be pushed out at once, Dr. Normandy prefers plugging the extremity of the pipe with a loaded valve, or allowing its contents to issue through a number of small holes drilled for a suitable length all round the extremity of the said barrel or pipe; and he finds that neutral fats may be thus converted into their corresponding fatty acids. The gun barrel may be straight, but is by preference coiled, as it then increases the friction, and saves room. The fatty acids, moreover, may be purified, when necessary, by enclosing the barrel or pipe from which they are shot or pushed out in a still, so that they may be volatilized as they issue from the pipe into the still by the heat of the steam alone; or if that be insufficient, with the assistance of a fire placed under the still, so that the volatilized fatty acids and the glycerine condensing in the worm of the still may finally yield the acids in a purer state.

The accompanying engraving represents an apparatus constructed for the purposes of the invention, and one which Dr. Normandy conceives will answer the purpose better than any other. A is a furnace containing a coil of pipe; B, B, are generators containing a series of hot-water pipe . within the generator; C, C, hot-water pipes, circulating according to Perkins' well-known principle of tubes closed in all



parts; D is a pump for injecting the oil and water; E, a valve loaded to the requisite pressure; F, a steam pipe, which carries steam into the mixture as it issues below G; G, a pipe for the exit of the steam and acidified fat; H, a tank for receiving the fatty acid, glycerine, and water.

In the conversion of fatty and oily substances into soap, the process is the same as that which has just been described, except that the water used to make an emulsion with fats or oils is replaced by a suitable quantity of an aqueous solution of potash or of soda.*

MINIÉ'S NEW BREECH-LOADING FIRE-ARMS.

M. C. Claude Etienne Minié, the inventor of the well-known minié rifle ball, patented in this country, on the 18th of May last, an improved breech-loading fire-arm, which is represented in the accompanying engraving. Fig. 1 is a longitudinal section

Fig. 1.

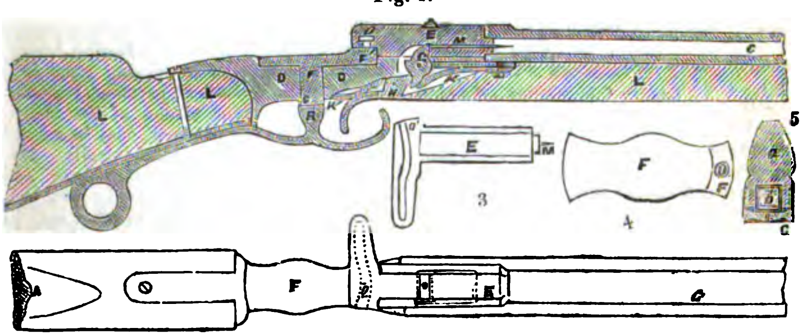


Fig. 2.

through the line A, B, of fig. 2; and fig. 2 is a top plan of a military musket or gun, which we have chosen to illustrate the principle of the invention; fig. 3 is an under plan of

* Dr. Normandy has obtained improvements a patent, dated May 16, 1

the sliding implements; and fig. 4 is a top plan o the swivelling piece, by which the implement shown at fig. 3 is made to slide backwards and forwards. C, is the barrel of the gun; D D, is a piece of wrought iron or malleable cast iron. This piece is for fixing the barrel, and has a recess for receiving the slide piece, E, which is for shutting the barrel. The piece, D, is also to hold the swivelling piece, F, which is let through it, the swivelling piece being for opening and closing the barrel breech. To the piece, D, is also secured the tumbler, G, the detent, H, and the springs, K and K′, belonging thereto, and acting upon the same. L is the woodwork of the gun; and M the priming needle. The sliding piece, E, is drawn back by the swivelling piece, F, being turned, and acting upon the sliding piece by means of a stud, O, on its front part, F′, entering a curved dovetail groove, O′, on the under side of the sliding piece, E. When the sliding piece has been slided back, the cartridge is laid in the recess left, and then the ball is pushed home by reversing the motion of the swivelling piece, which is done by turning the trigger guard, R, home, on which the swivelling piece, F, is keyed. When the arm has been discharged, and the piece, E, is drawn back for reloading, a shoulder on the under side of the piece, E, catches the point of the tumbler, G, and in so doing turns the same round against the spring, K, until the projection of the detent drops down upon the tumbler after the second notch, the part of the detent bearing against the wood preventing the same from turning further. The arm thus being cocked is then reloaded and closed, as stated above, and for firing, the detent, H, need only be pulled, thereby releasing the tumbler and causing it to strike upon the needle, M, the latter thus inflaming the fulminating matter contained in the cartridge. The cartridge which M. Minié prefers using is shown at fig. 5; where *a* is a lead ball, cast in a bullet mould, and having at its hinder part a recess or cavity for receiving a cap, *b*, with a three-fold charge. *c* is a socket, made of pressed leather, caoutchouc, or gutta percha, this socket being intended to protect the charge of the cartridge from any undue contact with fire and water, and to prevent the escape of gases. The spring, K′, is for pushing the trigger down into its original place after the arm has been discharged. M. Minié sometimes places on the gun barrel a second barrel, but not so strong as the first; this barrel being intended to hold a suitable number of charged balls or cartridges, according to the length of the gun. In that case he causes the slide piece, E, to draw out a ball cartridge from the cartridge barrel, and to drop it into the recess which is filled by the slide piece.

PROFESSOR SMYTH'S IMPROVEMENTS IN ASTRONOMICAL AND GEODETICAL INSTRUMENTS.

Professor C. Piazzi Smyth, of Edinburgh, has recently invented a number of improvements in astronomical and geodetical instruments.

The first of these improvements is applicable to spirit levels, and consists in placing them in a case wherein they are viewed by reflection and through a collimator lens, whose solar focus is to be made exactly equal in length to the radius of curvature of the level tube.

The second is applicable to the regulation of the size of the air bubble of a spirit level, and consists in introducing into the glass tube containing the fluid a diaphragm of glass, or of metal perforated by a small tube in the axis, or nearly so, of the great tube.

The third is applicable to collimators, and consists in making their object glasses of two or more lenses, capable of having their distances apart varied at pleasure.

The fourth is applicable to preserving a constancy in the angular position of any small table, shelf, or other such body exposed to the disturbing motion of a ship at sea; and it consists in making the body freely moveable on and balanced about its point or points of support, and contains within itself one or more wheels, to which a rapid spinning motion may be given.

The fifth is applicable to reflecting instruments, as sextants, and consists in causing each of the two objects observed, whenever an observation is made, to be reflected once on separate reflectors.

The sixth is applicable to the verniers of reflecting circles, and consists in placing them on the fixed part or the frame of the instrument, and making the divided limb of the circle the moving part.

The seventh is applicable to the telescope tubes and plain tubes of reflecting instruments, and consists in making them in a single block, capable of permanent attachment to the frame of one of the instruments. This improvement may be carried out either optically or mechanically. Mechanically, the two tubes may cross and look through each other, and by pivot motion at their junction one or other may be brought into position as required. Optically, the telescope tube may be rendered a plain tube at pleasure by turning up complementary concave glasses before its lenses, or by turning its lenses out of the optical axis.

The eighth is applicable to altitude and azimuth instruments, and consists in using a reflecting circle improved, as in the fifth of the improvements hereinbefore de-

scribed, in using such a reflecting circle for the altitude portion of the altitude and azimuth instrument.

The ninth is applicable to the foot screws of astronomical and geodetical instruments, and consists in making such screws parts of the solid stand on which the instrument rests, the foot of the instrument being caught and fixed on this new plan between two nuts traversing up and down such fixed screw.

The tenth is applicable to the reading of the graduation of any astronomical or geodetical instrument, and consists in noting the number of turns and parts of a turn of an endless screw working in teeth cut in the limb of such instrument.

The eleventh is applicable to equatorial instruments, and consists in making the telescope tube turn about its own axis, the said tube resting in a frame which has angular motion in the horizontal and vertical directions, while a reflector moving on an axis at right angles to the axis of the telescope is mounted in front of the object glass.

The twelfth is applicable to the stands of astronomical and geodetical instruments, and consists in making them of thin metal plates in a hollow form, so that they may be filled with fluids or comminuted solids on occasions when great steadiness is required.*

* Professor Smyth has obtained for the above improvements a patent, dated April 24, 1855.

MOREWOOD AND ROGERS' IMPROVEMENTS IN COATING WROUGHT IRON.

In the manufacture of japanners' ware, painted work, and for a great variety of purposes, very large quantities of tin plate and sheets of iron coated with alloys of tin, also of galvanized sheets of iron, are used, and in the coating of such plates and sheets, and other forms of wrought iron, it has been usual to dip the iron into the melted coating metal, by which means the iron has become coated with a comparatively larger proportion of tin or of its alloy, or of zinc, than is practically required for such japanned ware, painted work, &c. Hence, in such manufactures the cost is increased by the use of a larger quantity of the coating metal than is necessary, and the iron by being dipped into the melted metal is more or less injured in its toughness, and is rendered less flat and even on its surfaces. In some cases it has been the practice previous to dipping to deposit upon the articles to be coated a thin coating of tin from a solution of that metal, and Messrs. Morewood and Rogers, of Enfield, have found that such deposited coating of tin on wrought iron is sufficient when protected as we are about to describe for japan ware, painted work, and for a variety of other purposes. They have therefore patented* an invention which consists in obtaining on sheets or plates, or other forms of wrought iron, a coating of tin from a solution, as is well understood; in omitting the dipping in melted tin or its alloy or zinc; and in afterwards applying a non-metallic coating or coatings of a material or compound which is repellant of moisture, and which may be used at so low a temperature as to leave the iron as nearly as possible with its original form and toughness. They prefer for such coating or coatings a resinous, or such other matter as will not interfere with, but will rather aid the process of soldering the iron, when it may be desired to do so; by which means they obtain a manufacture of tinned wrought iron in sheets, plates, and other forms suitable for a great variety of uses at a considerably reduced cost.

Sheets, plates, or other forms of wrought iron having been coated by a deposition of tin from a solution (as is well understood, and which, separately, is not claimed by the inventors) are to be washed with water (by preference in a stream, either hot or cold), in order to free them as much as possible from the solution of tin or other matter which they may have taken up. After having been well washed, and without being allowed to dry or rust, they are coated with varnish or japan, or with solutions of melted resinous, gummy, oily, or greasy, or bituminous matters—such varnishes or matters as will aid in soldering, such as resins dissolved in wood or coal naphtha, or alcohol, or wood spirit, being preferred, as has been stated—this being effected by immersing them in a mixture of resin and tallow melted in a suitable pan or vessel. The preparation used is about two-thirds resin and one-third grease or tallow, and the temperature of the mixture is kept at about 240° of Fahr., or at such a point that on withdrawing the metal from the hot mixture the moisture will have been boiled off from the surfaces, and a thin coating of the mixture be found to cover the metal, which thin coating is reduced by rubbing the metal in hot bran or sawdust, placed in a pan and kept heated with boiling water underneath, or by other suitable arrangements; or sometimes the solution-tinned articles are dried in an oven, or over a coke fire or otherwise, immediately after washing them, and then, instead of coating them by dipping into the before-mentioned melted mixture of resin and grease, the inventors dip them into a

* Patent dated May 18, 1855.

solution of resin and tallow dissolved in coal naphtha, in the proportion of two ounces of tallow and ten ounces of resin to one gallon of coal naphtha, at the ordinary temperature of the atmosphere, and after allowing the articles to stand in order to dry, immerse them in the solution of shellac and resin hereafter mentioned. They take the sheets, plates, or other articles coated with resin and tallow, and dip them into a solution of shellac, or shellac and resin, in the proportion of three-fourths shellac to one-fourth resin dissolved in wood naphtha or alcohol (say about three-quarters of a pound of shellac and one-quarter of a pound of resin in two gallons of wood spirit or strong alcohol of 50° to 60° above English proof), by which means they obtain a coating which will repel moisture, and which is believed to be the best for the purposes of the invention; but other of the matters above mentioned may be used in a similar manner for the coating in place of the particular ones above described, or compounds of such other matters may be employed. When the matters described are used in the state of solution, the inventors prefer to apply them at the ordinary temperature of the atmosphere, and consider it desirable not to apply any of the matters in a fused or melted state, if when fused or melted they are at a higher temperature than 300° Fahr.

BRITISH PATENT LAW FOR INDIA.

We are gratified at being able to announce that a Bill for granting to inventors exclusive privileges in their inventions has been brought before the British Legislative Council in India, and after being read a second time on the 28th July, 1855, was referred to a Select Committee, who were to report thereon after the 1st of November last. As we learn by private correspondence that this Bill is likely to be materially modified before passing into law, we shall now publish nothing more respecting its nature than is contained in the following brief abstract.

The true and first inventor of any new and useful manufacture may petition the Governor-General of India in Council for leave to file a specification thereof. Every such petition shall be signed by the petitioner, or in case the petitioner shall be absent from India, by an authorised agent, and shall state the name, vocation, and place of residence of the petitioner, and shall describe the nature of the invention. Upon such petition, the Governor-General of India in Council may make an order authorising the petitioner to file a specification of the invention.

Before making such order, the Governor-General of India in Council may refer the petition to any person for inquiry and report, paying such person a reasonable fee, the amount of such fee, in case of dispute, to be settled by the Governor-General of India in Council.

If, within the space of six calendar months from the date of such order, the petitioner shall cause a specification of his said invention to be filed, he, his executors, administrators, and assigns, shall be entitled to the sole and exclusive privilege of making, selling, and using the said invention in India, and of authorising others so to do, for the term of fourteen years from the time of filing such specifications and for such further term, if any, not exceeding fourteen years from the expiration of the first fourteen years, as the Governor-General of India in Council may think fit to direct, upon petition.

Any order authorising the filing of a specification, or for extending the term of such exclusive privilege as aforesaid, may be made subject to any such conditions and restrictions as the Governor-General of India in Council may think expedient.

Every specification of an invention filed under this Act shall be in writing, and shall be signed by the said petitioner, and shall particularly describe and ascertain the nature of the said invention and in what manner the same is to be performed.

Every petition for leave to file a specification, and every specification filed under this Act, shall be left with the Secretary to the Government of India in the Home Department, and every petition and specification shall be accompanied by a declaration in writing signed by the inventor; and if the inventor be absent from India, the petition and specification shall also be accompanied by a declaration signed by the agent who shall present or file the same, to the effect that he verily believes the declaration, purporting to be the declaration of the inventor, was signed by him, and that the contents thereof are true.

No specification shall be filed until the petitioner shall have paid all fees payable under this Act, including the fees, if any, of the person or persons to whom the petition shall have been referred for inquiry and report.

At the time of delivering the specification for the purpose of being filed, the petitioner shall cause to be delivered to the said Secretary fifty printed copies thereof, which shall be disposed of by the said Secretary in such manner as the Governor-General in Council shall from time to time direct.

No person shall be entitled to any exclusive privilege under the provisions of this

Act if the said invention, at the time of presenting the petition for leave to file the specification, was not a new invention as to the public use and exercise thereof; or if the same is not useful to the public; or if the petitioner is not the true and first inventor thereof; or if the specification filed does not particularly describe and ascertain the nature of the invention, and in what manner the same is to be performed.

Every exclusive privilege under this Act shall cease if the Governor-General of India in Council shall declare that the same, or the mode in which it is exercised is mischievous to the State, or generally prejudicial to the public; or if a breach of any special condition on which the petitioner was authorised to file a specification, or upon which the term of the exclusive privilege was extended, shall be proved to the satisfaction of the Supreme Court of Judicature at Fort William in Bengal, and if the Governor-General of India shall thereupon declare that such exclusive privilege shall cease.

An importer of an invention shall not be deemed the true and first inventor within the meaning of this Act, unless he is the actual inventor.

The actual inventor, though a foreigner resident abroad, shall be deemed the true and first inventor within the meaning of this Act.

ON SOME NEW PROPERTIES OF FRESHLY-CALCINED CHARCOAL.

BY M. MORIDE.

The deoxidising power of wood charcoal is well known, when used in the dry state and under the influence of an elevated temperature; but I do not know that any one has mentioned it as reducing metals in the midst of neutral, alkaline, or acid liquors, neither am I aware that any one has observed that in contact with a dilute and alcoholized acid, freshly calcined wood charcoal caused the formation of ether. I am continuing this study, but I have determined to make known the results of my first experiments.

Coke, charcoal from lignites, animal and bone charcoal, do not produce the effects of which I am about to speak.

1st. When incandescent wood charcoal is plunged directly, or after being extinguished with cold water, into an acid solution of sulphate of copper, the metal is gradually deposited upon the charcoal until it may be entirely recovered. In neutral or alkaline liquors the reaction is not so well performed. In Barreswill's liquor, for instance, the copper deposited upon the charcoal has a very beautiful iridescent appearance. When nitric acid, hydrochloric acid, or sulphuric acid is used to acidify the solutions, the effect is the same, only that it is clearest with sulphuric acid.

2nd. I have observed that the metallic salts of organic acids are less easily decomposed than those which contain mineral acids.

3rd. The solutions of silver in nitric acid, whether neutral or acid, and chloride of silver dissolved in ammonia, are easily decomposed by freshly calcined wood charcoal. The silver is soon seen to cover the charcoal in the most beautiful manner; it sometimes appears crystallised.

4th. Copper may, by this same means, be precipitated from ammoniacal solutions; but if these solutions likewise contain silver, the latter will be first reduced.

5th. Finally, incandescent wood charcoal plunged in Fowler's solution, acidified with sulphuric acid, produces a very agreeable ether, which I intend to examine. It will be easy to make in this way, by varying the acids, nitric, acetic, sulphuric ethers, &c.

6th. Zinc, iron, platinum, lead, and mercury may be precipitated by wood charcoal; but they redissolve in acid liquors: this does not occur at all with silver, and with copper not until twenty-four hours after the operation.—*Comptes Rendus*, and *Chemist.*

NEW ORNAMENTAL CASTINGS.

Works for the prosecution of an entirely new branch of industry have been opened by Mr. Chance, about five miles from Birmingham—the manufacture of architectural decorations and adjuncts in basalt. The ragstone of the neighbourhood is melted and cast in hot moulds, and cornices, doorheads, and other architectural enrichments are produced, of very lasting quality. When cast in cold moulds, a glassy lava, known as obsidian, is produced—an interesting fact in a geological point of view.—*Builder.*

In support of the probability of an extension of this new branch of industry, we may mention that operations are now going on at Ordnance Wharf, Rotherhithe (the works of the Colonial Gold Company), where furnaces have been erected for the reduction of gold quartz by direct fusion, under the patent of Mr. Charles Low, late of Swansea. The quartz thus treated is first crushed moderately small, then calcined or roasted, and afterwards fused with a mixture of fluorspar, lime, and oxide of iron, which liquefying agents combine with the silica, and render the matrix perfectly fluid. The primary object is to liberate the gold found by analysis to exist in the quartz, the particles depositing in a bed, or bath, of

molten lead at the bottom of the furnace; but the fused mass run off as refuse is capable of being cast into iron moulds, and will form ornamental bricks, or blocks of stone, of lasting quality and great beauty, which practical use of the refuse will materially lessen the cost of the manipulation. The metallic alloy at the bottom of the furnace is to be subjected to direct cupellation for the gold produce, the result of which, as an experiment, is watched with considerable interest by scientific men.

THE COSMORAMA STEREOSCOPE.

This is a modification of the beautiful instrument invented by Sir David Brewster. The improvement consists in employing, instead of the two small semi-lenses, one large one, which is rendered stereoscopic by cutting an ordinary plano-convex lens in half, removing more or less of the opposite outer diameter, and then transposing the pieces so that the original centre of the lens becomes the two sides, and the outer edges come together. The advantages obtained by this instrument is an increased facility for viewing as one the double pictures: only one adjustment is necessary for all sights, namely, increasing or diminishing the distance between the line and the double pictures. By using larger lenses of proper focal length, pictures of any dimensions may be viewed stereoscopically.

This is a very beautiful and interesting instrument. It is made by Messrs. Knight, of Foster-lane.—*Chemist.*

Papers and Practical Illustrations of Public Works of Recent Construction, both British and American. London: John Weale, 59, High Holborn. 1856.

This is a valuable volume, containing papers (amply illustrated by fifty large and excellent engravings) on the Niagara Falls Suspension Bridge; the Paddock, the Lockwood, the Denby Dale, and the Titheburn Street Viaducts; the Newark Dyke Bridge on the Great Northern Railway; and the Mountain Top Track in the State of Virginia; also, papers on the Preliminaries to Good Building, Suggestions for Increasing the Circulating Medium in Aid of Commerce and Mechanical Enterprise, a copious Memoir of the late Brigadier-General Sir Samuel Bentham, with an Account of his Inventions, and Reviews, Communications, Correspondence, &c. The work is, as some of our readers will remember, supplementary to previous publications, and similar volumes are to be issued when Papers and Illustrations on Architecture, Civil and Mechanical, and Military and Naval Engineering of equal importance shall be received. This volume should be in the library of every engineer who has to construct, or who wishes to understand the construction of great engineering works.

Letter on the Operations of the Smoke Nuisance Act, with Remarks on the Formation and Prevention of Smoke, and the Remedy against the Continuance of the Nuisance. Addressed to the Sanitary Commissioners of Liverpool. By C. Wye Williams, Esq. London: John Weale, Holborn. 1856.

This letter, which is addressed to R. M. Beckwith, Esq., Chairman, and the members of the Smoke Nuisance Committee, is divided into three parts, in which are treated:—1. The Operation of the Smoke Nuisance Act. 2. The Formation and Prevention of Smoke. 3. The Remedy of the Nuisance. It is well worthy the perusal of all interested in the construction, management, and employment of furnaces, and throws much light upon the smoke question. Mr. Williams's views have been so fully placed before our readers, that we need not here repeat them. The following passages from the last portion of the pamphlet are important, and do no more than suggest a just protection for manufacturers and other owners of furnaces.

"Among the recent convictions by the magistrates of Liverpool, one, among many similar cases, may here be mentioned, as illustrative of the hardship, and even injustice, arising out of the construction and arbitrary terms of the late Act of Parliament, and in visiting the ignorance or mistakes of the boiler-maker on the innocent owner of a steam boiler.

"Mr. ——, a corn miller, on being indicted for the unquestionable nuisance of a continuous emission of dense smoke from his chimney, pleaded, that he was not the author or cause of the evil complained of, and which he had no means of preventing or correcting. He said he knew nothing of engineering, or boiler-making, or how smoke was to be consumed. That although the Act stated that the owner was required to burn or consume the smoke issuing from his chimney, it had not stated how that was to be effected. He had, indeed, been informed, that the highest chemical authorities stated that smoke was incombustible,—consequently, that by the terms of the Act he was required to perform an impossibility. He said he had ordered a steam engine and its appendages from an engineer of eminence. He gave no limitation as to size, construction, or expense. Nevertheless, no sooner was it set to work, than his neigh-

bours complained of the nuisance the chimney created. He was willing to adopt any remedy the magistrates might direct. On what principle of justice, then, he asked, should he be made accountable for the errors of another?

"The magistrate, in giving judgment, observed, that he had no discretion in the case. The Act absolutely required that, 'If any person shall use any furnace which shall not be constructed so as to consume or burn its own smoke; or shall so negligently use any such furnace as that the smoke arising therefrom shall not be effectually consumed or burnt, any person so offending, being the owner or occupier of the premises, shall pay a sum not more than five pounds, nor less than forty shillings.' Under these circumstances he was not called on to advise, or show how furnaces should be constructed. The nuisance was proved to exist, and the penalty must be inflicted.

"Now, although the law visits the miller in the first instance, he certainly had his remedy, for had he brought an action against the maker of the steam engine and boiler, he would have been entitled to recover the amount of the penalty inflicted, as consequential damages, arising out of their malconstruction, or defective arrangements. This view of the subject is confirmed by the opinion of the same magistrate in a more recent case, where it was proved that a boiler and its furnaces were imperfect and ill-constructed. In that case, the magistrate observed, as reported, that 'The boiler being defective was not the fault of the owners of the steam-boat which created the nuisance; that they had given directions for a proper instrument, and went to a respectable tradesman to supply them; and if they chose, they might follow it up and recover, in another court, from the maker of the boiler, the loss they had sustained.'

"Here the finger of the law pointed in the right direction. It was a machine that could not be worked without creating a nuisance, or indictable offence. The responsibility then lay not with the unoffending miller, but with the incompetent maker, who had undertaken to construct a perfect apparatus, and had failed in doing so. Not only legally, but morally and commercially, he was liable for the imperfection of the machine he had supplied. Consequently, if the engineer, who ought to be acquainted with the details of his business, proves to be incompetent, he alone should be held accountable. Here, then, a remedy is at once suggested."

* * * *

"And see the strict justice of such an arrangement. It is not only the duty, but it is peculiarly within the province and power of the engineer—an educated, professional man—to study and understand, and reduce to practice, what belongs to the use of the fuel he employs, and its application in the generating steam for the purposes of the engine he contracts to make. Without this knowledge, the efficiency of his work must remain a matter of chance. He makes his calculations as to the quantity of steam, and the amount of pressure required, with the other details of his engine; so should he be equally attentive and skilful in those of the boiler, with its furnaces and flues, which are but part and parcel of the one apparatus. It cannot surely be the province of the miller, or the silk, cotton, or other manufacturer with whom he contracts, to study these things, or teach the engineer how to construct the apparatus he undertakes to make. If, however, the scientific engineer will not make himself master of his business, and learn how furnaces should and can be made so as to generate heat and steam without creating a nuisance, he cannot claim to be a competent tradesman, and must be held responsible for the consequences of his inexperience. If he work by chance, he is not justified in experimenting on the construction of a boiler (as many do), and then throwing the responsibility of its failure on the purchaser.

"With respect to the principles on which combustion is effected, it will not suffice for an engineer to allege that the use of coal, or the gas from coal, and the means of effecting their combustion without smoke, is still among the undiscovered mysteries of nature. This is not the fact. It is directly the reverse of the fact. The subject, in all its details, is thoroughly understood and reduced to practice. The chemistry of combustion, and the elements of the fuel with their peculiar affinities and respective combinations, are, in our days, as well known and as clearly laid down in works of unquestionable authority, as those of any other process in science or art.

* * * *

"Let, then, the study of the laws by which perfect combustion may be effected, have the serious attention of all who desire to know what they are about when undertaking to construct machines by which those laws are to be reduced to practice.

"Hereafter, then, the remedy against the hardship and injustice under which the public have hitherto laboured, will be found within their reach. They have only to require that those who undertake to make boilers shall also undertake to make them in all respects perfect."

The Factory Controversy; a Warning against Meddling Legislation. By HARRIET MARTINEAU. Issued by the National Association of Factory Occupiers, 13, Corporation-street, Manchester. Manchester: Ireland and Co., Pall Mall. 1855.

As this pamphlet has been fiercely and most unreasonably assailed in several organs of the press by writers who have neither the fairness to test the statements it contains, nor the knowledge of machinery essential to a just appreciation of the controversy in which it takes a part, we strongly recommend a careful perusal of it to such as take an interest in the circumstances which have led to the formation of the National Association of Factory Occupiers. Being of a controversial character, and dealing, as it professes to deal, with serious misrepresentation on the part of Mr. Horner, the Government Inspector, and one of the writers in *Household Words*, it is not inexcusable that the pamphlet is somewhat severely penned. Upon the whole, however, we think Miss Martineau has written with great judgment, and her effort will certainly have the effect of placing the whole subject of the fencing of machinery under legal penalties before the public in a very intelligible manner.

The great fault of the authoress consists, according to some journalists, in the attack she makes upon Mr. Dickens, as the responsible editor of *Household Words*. Now, no one but a cynic could be gratified to see one so genial and noble-minded as Charles Dickens assailed without good reason; but if he has assumed a false position, from which it is extremely necessary to dislodge him, there can be no question as to the propriety of Miss Martineau's proceeding. The truth is, that the writer in *Household Words*, in alleging that a vast number of deaths annually occurred through the refusal of factory proprietors to fence their machinery in a reasonable manner, first imagined a horrible slaughter of the innocents, and straightway proceeded to stigmatise the imaginary slaughterers. But though imaginary as slaughterers, the objects of his attack were real as gentlemen, and therefore very properly resented his conduct, and, for our part, we think Mr. Dickens would be acting with grace and honour, were he to retract at once the unjust aspersions which have proceeded (probably from rashness rather than malevolence) from the pen of either himself or one of his contributors.

PARKER'S PATENT SMOKE-CONSUMING APPARATUS.

To the Editor of the Mechanics' Magazine.

SIR,—In looking through your Magazine of last year, I find at page 86 (No. 1642, week ending January 27), a letter signed "Wm. Baddeley," and headed "Parker's Patent Smoke-Consuming Apparatus," in which the following question is propounded, viz., "Is it possible that the *simple*, '*inexpensive*,' and easily-applied apparatus of Mr. Parker is really sufficient for its intended purpose? To this practical question a decidedly practical answer is furnished by the fact that Mr. Parker's apparatus has been for some time in use at Messrs. Champion's Lead-works, Islington, and Messrs. Brandram's Chemical-works, Rotherhithe, &c., &c., in each case taking '*precedence*' of all other plans in these localities."

I am very sorry that, during a temporary absence from town, the number in which the above appeared, was put away unopened, or I would at that time have given Mr. Baddeley's assertion, so far as the works of my firm are concerned, a very "practical answer."

Mr. Parker's invention was the *first* that I had the folly to try under our engine and high-pressure boilers, and was such a dead failure, that I pulled it out in a week; when, lo and behold! the air holes were gone, and half the apparatus was fused into such a shape, that one could hardly recognize the original. You will therefore observe that it could not take *precedence* in our case, as it was the *first;* and as to the expense, two of the castings were for tubes of 2 feet 6 inches diameter, and the third for a tube 3 feet diameter, the whole costing, fixed by the patentee's men, £25. This I thought rather large for such small matters in cast iron.

As I hope shortly to send you an account of my trials, failures, and disappointments, with the methods by which I ultimately succeeded in consuming the smoke in these works, I will not now state my opinion of the reason why Mr. Parker and other patentees failed (at all events with us), but simply add that, except in one instance, I have now no patent at work; this one is under a high-pressure boiler at "*regular work;*" at irregular work, when sudden calls were made for steam pans, even that has proved an utter failure.

I am, Sir, yours, &c.,

ANDREW B. BRANDRAM.

Rotherhithe, Jan. 7, 1856.

P.S. Mr. Parker was with me during the trials with his patent, saw the smoke which was pouring out of the shaft, and no other fires but those fitted with his own patent

were in communication with that shaft; so that I am at a loss to conceive how he could suffer Mr. Baddeley to pen such a statement of his invention.—A. B. B.

PHILLIPS' FUNERAL CARRIAGE.

To the Editor of the Mechanics' Magazine.

Sir,—Mr. H. L. Phillips' design for a funeral carriage, given in your last number, is the compendium and combination of all the existing desecrations.

1. The body, instead of preceding the mourner, is shoved into a hind boot.

2. The body is further dishonoured by being sat upon by the men, who, in cold weather, will necessarily execute the double shuffle upon it.

3. The mourners' legs would not reach the bottom of the carriage by six inches, but would dangle like children's on a high chair.

4. The draught would be heavy, and the motion intolerable on rough roads.

5. Its ugliness would kill the sexton.

I am, Sir, yours, &c.,
A Mourner for P——.

Parthenon Club, Jan. 7, 1856.

LIQUID FIRE AND SPHERICAL SHELLS.

To the Editor of the Mechanics' Magazine.

Sir,—The experiment, in the marshes at Woolwich, with Captain Disney's liquid fire shells, as recently reported, prove that a shell to explode *within* a shell is not the best means for conveying the liquid fire to the mark, because if the outer shell is made so *thin* that the explosion of the *inner* shell will burst it, then it is not strong enough to resist the fire of the charge in the gun or mortar. I would have the fuse case *only* to be shattered after the shell has penetrated the object to be set on fire. This can be effected by placing a bursting charge within the case itself, like a boy's squib-cracker; then the liquor would decant through the fuse-hole, which, for this object, could be made wider than at present. A shell on this construction could be made to serve out the liquor in its passage over a dock-yard or arsenal. I do not pretend to any claim on the liquid fire concoction, bisulphuret of carbon and phosphorus, which I consider to be the most "naufragious" fire-stuff ever invented by the ingenuity of man.

I am, Sir, yours, &c.,
J. Norton.

Rosherville Hotel, Dec. 29, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Morton, A., and E. Hunt. *Improvements in motive power engines.* Patent dated June 5, 1855. (No. 1287.)

The first part of this invention relates to the construction of a reciprocating engine, in which a number of cylinders are placed round one shaft; the second part relates to certain modes of guiding the pistons, &c.; and the third to a novel kind of reciprocating engine to be used where comparatively small power is required. In this engine a light steam cylinder is mounted on a pipe upon which the steam piston is formed or fixed, the cylinder being arranged to traverse backward and forward on the pipe upon which it is fitted, with suitable stuffing boxes at each end. The steam enters at one end of the pipe, and the exhaust takes place through the other; the valves are in the inside of the piston, and are worked by a rod passing through one of the pipes, and issuing therefrom through a stuffing box.

Gedge, J. *Improvements in the means of preserving grain.* (A communication.) Patent dated June 6, 1855. (No. 1288.)

The inventor encloses grain in a close case or tank, into and through which air may be passed at pleasure by means of a pipe, &c.

Gedge, J. *Improvements in the manufacture of flat tiles.* Patent dated June 6, 1855. (No. 1289.)

The inventor forms flat tiles with protuberances which add to the solidity of the tile, and serve as steps for the tiler, permitting him to walk about on the roofing, &c.

Hopper, G. *Improvements in rolling and shaping metals.* Patent dated June 6, 1855. (No. 1292.)

This invention consists in the employment of rolls for forming the square and round portions of railway pins, patented by the inventor March 13, 1854, which rolls have one portion of the grooves semicircular and another portion V-shaped.

Robertson, J. *Improvements in transmitting motive power in certain circumstances where reversing actions are necessary.* Patent dated June 6, 1855. (No. 1294.)

This invention mainly consists in the use in machinery where reversing mechanism is required, of one or more frictional driving or driven pulleys, arranged upon a single spindle "in such manner that either the driving or the driven pulley or pulleys may be shifted slightly for obtaining the reversing action, the shifting being effected by turning the support of the shifting pulley or pulleys upon an axis eccentric to its or their own axis of rotation."

NUNN, H. *Improvements in the construction of carriages for invalids and children, part of which improvements is also applicable to street cabs and other carriages.* Patent dated June 6, 1855. (No. 1295.)

The inventor constructs the main body of the carriage of two curved metal frames, jointed together and shaped so that they will fold the one within the other. The arms and back of the carriage are formed of a third frame which is jointed to the bind frame in such manner that it will fold down within the hind frame, &c.

BOUCHER, J. *Improvements in powder-flasks, and in the sights and ramrods of fire-arms.* Patent dated June 6, 1855. (No. 1296.)

According to this invention a powder-flask is made with a rotating cylinder having several chambers, each of the correct size for a charge of powder. This cylinder rotates between the flask which contains the powder and the spout by which a charge is poured into a fire-arm, so that when one of the chambers is brought into position to be emptied, another is brought opposite the opening into the flask, and will be filled when the other is emptied.

The pillar of the sight of a fire-arm is made to fold on a joint or hinge, and is kept upright by a spring. The pillar has a screw parallel to it, with a slide which is guided by the pillar, and as the screw is turned the slide is moved. The ramrod is made partly of metal and partly of papier-maché.

BAINES, W. *Improvements in certain parts of railways, and for the methods of manufacturing and constructing parts of the same.* Patent dated June 6, 1855. (No. 1297.)

This invention comprises a mode of strengthening the point or end of the switch tongue, and of arranging and making the adjacent rails to conform thereto, as described. Also, certain arrangements for giving the switch tongue a larger bearing surface, for preventing it from rising, for enabling it to clear away objects coming between it and the fixed rail, and for arranging the chairs with their raised surfaces or seats to correspond therewith.

FAVRE, P. A. *Certain improvements in employing the residue arising from the lixiviation of crude sodas.* Patent dated June 7, 1855. (No. 1298.)

Claim.—The utilisation of the sulphate wasted in the lixiviation of crude soda, by employing in the treatment of these residues the muriatic acid evolved from the sulphate of soda kilns.

RAMSBOTTOM, J. *Improvements in safety-valves and feeding apparatus for steam boilers.* Patent dated June 7, 1855. (No. 1299.)

Claims.—1. Connecting two or more safety-valves, and loading the same at one point by means of springs or weights acting on cross bars. 2. The application and use of a cistern attached to the engine for supplying the feed-pumps of locomotive engine boilers, as described.

BUNCLE, J. *An improvement in bleaching resinous substances (calophane) for the manufacture of soap.* Patent dated June 7, 1855. (No. 1300.)

This improvement consists in melting the resinous substances by a jet of steam or otherwise, boiling the same with caustic alkali, adding a little muriate of soda when boiling, and then passing currents of air through the calophane, which is to be allowed to stand for a short time, and is then to be ladled from the impurities which descend to the bottom of the vessel.

HEAP, M. *Certain improvements in machinery or apparatus for grinding dye woods or roots, and for other similar pulverizing purposes.* Patent dated June 7, 1855. (No. 1301.)

This invention mainly consists in the use of a series of rapidly revolving circular saws (from thirty-two gauge to eighteen inches width on their peripheries) placed on one shaft.

REYNOLDS, J. A. *Improved machinery for discharging volleys of shot.* Patent dated June 7, 1855. (No. 1304.)

This invention consists mainly of a hollow cylinder, the periphery of which is pierced with rows of holes, into which are fitted breech chambers. To the inner end of each of the breech chambers a nipple is fitted for receiving a percussion cap or other primer, and the chambers are brought successively in a line with a row of barrels.

GUFFROY, C. C. J. *An improved smoke consuming apparatus.* Patent dated June 7, 1855. (No. 1306.)

This invention consists in the construction of a smoke consuming apparatus, in which, after the fuel has been once lighted, the fresh fuel is placed on the incandescent mass, and the gaseous products from such fresh supply are made to pass through the burning mass; the combustion is supported and assisted by jets of air introduced through apertures or nozzles. Grate or fire bars are dispensed with, and an aperture is provided in the "tail" or bottom of the apparatus from whence cinders, clinkers, &c., may be removed. A partition plate is added in the upper part of the apparatus to prevent the smoke and gases emitted from the fresh fuel passing off into the heat flue without first traversing the incandescent mass. This partition may, in certain cases, be provided with apertures for the admission of air to support combustion.

TUCKER, R. A. *Using the gas and smoke*

arising from coal or other substances during the process of combustion for fuel. Patent dated June 7, 1855. (No. 1307.)

The inventor divides the furnace into two compartments, which are fed alternately. We shall probably describe the invention at length hereafter.

PETERS, R. *Improvements in the manufacture of ordnance-shells and other hollow vessels.* Patent dated June 7, 1855. (No. 1308.)

A full description of this invention was given at page 577 of our last volume. (No. 1689.)

FONTAINEMOREAU, P. A. L. DE. *Certain improvements in the manufacture of iron shovels.* (A communication.) Patent dated June 8, 1855. (No. 1310.)

The patentee describes a method of manufacturing two shovels at once from bar iron.

LIPPMANN, I. *Improvements in the treatment of hides and skins for the manufacture of leather.* Patent dated June 8, 1855. (No. 1312.)

Claims.—1. Preparing the skins or hides in a machine in which they are subjected to a fulling or beating action, whereby they are rendered soft and supple and brought to a proper state to be acted on by the second or splitting machine. 2. As regards the splitting machine, communicating a very quick and rapid vibratory motion to the knife, in combination with a very slow rotary motion to the cylinder or roller to which the skin or hide is attached, whereby the epidermis of the skin may be removed; this may then be used for any purposes where a thin skin of leather is required, leaving the grain on the other part of the skin, which may be used for the purposes for which thick leather is usually employed.

CHANTRELL, G. F. *Improvements in apparatus applicable to the manufacture and revivification of animal or vegetable charcoal.* Patent dated June 8, 1855. (No. 1313.)

This invention is an improvement upon that patented by the inventor, October 17th, 1853, and described at page 425 of our sixtieth volume, number 1604. The inventor now raises the furnaces nine inches or more above the level of the bed plates, which form the bottom of the char chambers and upon which they are built, for the purpose of reducing the intensity of the heat at the bottom of the chambers.

NETTLEFOLD, J. S., E. J. NETTLEFOLD, and J. H. NETTLEFOLD. *Improvements in locks.* (A communication.) Patent dated June 9, 1855. (No. 1315.)

Claims.—1. Moving the bolt by means of a diagonal slot or two inclined planes in a sliding plate acting upon a stud or studs in the bolt. 2. The application to locks of an oscillating tumbler for moving the bolt. 3. The application to locks of an expanding stump constructed as described. 4. The application to the bolts of a hanging plate carrying a stump, and also a stud which enters an inclined notch in the bolt, so that when end pressure is applied to the bolt the inclined face of the notch acting upon the stud throws up the hanging plate and prevents the stump from entering the notch in the lever. 5. The application to locks of two discs carrying two stumps, acting upon the bolt so as to prevent the stump on one of the discs from entering the notch in the lever as described, when end pressure is applied to the bolt. 6. The application of a sliding shield operating so as to prevent access to the levers by means of false keys. 7. The application to locks of two swinging pieces forming an expanding chamber as described.

LAFOND, E. J., and L. A. DE CHATAUVILLARD. *Improvements in apparatus for lighting.* Patent dated June 9, 1855. (No. 1316.)

This invention consists—1. "In improved apparatus by which the gas or vapour produced from any inflammable liquid is self-generated. 2. In improved arrangements or means for purifying the said vapour or other inflammable matter. 3. In a peculiar construction of burner or apparatus by which the air is admitted to the vapour or gas."

VARLEY, C. F. *Improvements in electric telegraphs.* Patent dated June 9, 1855. (No. 1318.)

This invention consists in "obtaining nearly the whole of the magnetic power evolved by the wire coils, and using the same in conjunction with the deflecting power of the coils of wire forming a peculiar shaped electro-magnet for telegraph relays," &c., &c.

BRIGHT, T. *Improvements in apparatus for the prevention of waste in water or other fluid supplies.* Patent dated June 9, 1855. (No. 1319.)

Claim.—An arrangement for the admission and discharge of fluids into and from an intermediate closed vessel, by means of a double-action cock, so arranged that the inlet passage or supply will always be closed when the outlet passage or drought is open, and the outlet passage or drought will always be closed when the inlet passage or supply is open.

COOKE, M. J. *Preserving provisions and vegetables suitable for armies in the field, for vessels on long voyages, and other purposes, and also for the necessary apparatus for preserving and preparing the same for food.* Patent dated June 9, 1855. (No. 1320.)

A description of this invention will be given hereafter.

ROBINSON, J. *Improvements in tables.* Patent dated June 9, 1855. (No. 1321.)

This invention is principally intended to be applied to tables used in ships, and is calculated to afford accommodation for a greater number of passengers than can be accommodated with tables as at present arranged. It consists in dividing the tables down the centre, and in connecting each half or side of the tables with the stools by an iron or metal casting, so formed as to slide in a groove or on a rail fixed transversely in the cabin floor. One side of the tables is provided with an inner flap, and under the centre of the tables, when closed, is fixed a row of stools or seats. In order to provide for 150 passengers at a table intended, under ordinary circumstances, to dine but 100, the two sides of the tables are slided out from the centre, together with the outside set of stools, and the folding leaf on the inner side of one of the tables is turned up, and at once accommodation is provided for one-third more.

GREENWOOD, J. *Improvements in purifying oils.* Patent dated June 9, 1855. (No. 1322.)

Claim.—"The use of a solution of barytes, either caustic barytes or sulphuret of barytes, or other suitable solution of barytes, either separately or combined, for the purpose of purifying oils."

COLT, S. *An improvement in the construction of fire-arms.* Patent dated June 9, 1855. (No. 1323.)

In this invention Mr. Colt forges the barrel without the lump which is commonly formed upon it at the touch-hole, and bores a hole in the side of the breech barrel, tapping it to receive a hollow screw plug, which, when inserted, will project laterally from the barrel like the ordinary lump or shoulder. When screwed up to its place the plug is attached permanently to the barrel by brazing. The end of this plug is closed by a moveable screw, and a lateral hole is bored into the plug to receive a cone-shaped nipple, which is so constructed as to concentrate the percussion fire immediately before it strikes upon the charge.

COLT, S. and W. T. ELEY. *Improvements in the manufacture of cartridges.* Patent dated June 9, 1855. (No. 1324.)

This invention mainly consists in the application of a detachable outer case or envelope for protecting the cartridge from injury, and the use of a tape or string, or its equivalent, for stripping off the case, and for laying bare the powder.

HALL, W. K. *Improvements in breaks for railway carriages.* Patent dated June 11, 1855. (No. 1325.)

In this invention the break blocks and the levers by which they are applied are fixed upon and carried by a swinging frame, mounted under the main frame of the carriage and above the axle, so that a lever is held against the bottom side of the draw-bar by the preponderating weight of the opposite portion of the frame. The carriages are connected and drawn by this draw bar which is allowed a longitudinal motion of a few inches. When the velocity of the train is lessened in any manner the momentum of the carriages carries them forward to the extent allowed by the play of the draw bars, and so applies the breaks to the wheels through the intervention of the lever.

BARLOW, H. B. *Improvements in certain parts of machines, and in slubbing and roving cotton and other fibrous materials.* (A communication.) Patent dated June 11, 1855. (No. 1326.)

This invention consists—1. In constructing the pressers of flyers used in slubbing and roving frames of an improved shape. 2. In an improved mode of giving pressure to the pressers of flyers. 3. In an improved mode of increasing or diminishing the pressure of the spring acting on the presser. 4. In making the spool revolve in the same direction, but faster than the presser.

KIND, J. D. *An improvement or improvements in spindles for locks and latches, and in attaching knobs or handles to the said spindles.* Patent dated June 11, 1855. (No. 1328.)

This invention consists in forming a screw or rack on one or both ends of the spindle, the said screw or rack being slit longitudinally, and fixing the knob or handle to the screwed end of the spindle, by passing a pin screw or cotter through a hole across the neck of the knob or handle, and also through the slit spindle, thereby causing the slit screw or rack to expand and engage in a screw or rack in the neck of the knob or handle.

JOHNSON, J. H. *Improvements in governors or regulators for prime movers.* (A communication.) Patent dated June 11, 1855. (No. 1334.)

The improved governor consists of a fan-wheel rotating in any suitable fluid contained inside a closed vessel which is fitted internally with fixed blades or stops to obstruct as much as possible the rotation of the fluid. This box serves as the support for the gearing of the apparatus, &c.

LIPPMANN, I. *Improvements in dyeing or colouring the hides and skins of animals.* Patent dated June 11, 1855. (No. 1335.)

Claims.—1. Submitting hides or skins to the process of dyeing before being tanned. 2. A method of imparting to skins or hides a mottled appearance. 3. A method of

imparting to the surface of hides and skins a metallic lustre.

LIEBISCH, J. J. *Improvements in rails for railways.* Patent dated June 12, 1855. (No. 1336.)

This invention consists in making each rail in two or more parts longitudinally, the bottom part having a longitudinal groove for the top part to fit into, or the bottom part being made in halves to clip the top part, or the top part having a groove in the underside of it for the bottom part to fit into, so that the top part on which the principal wear takes place may be easily taken off and renewed.

ARMITAGE, W. *Improvements in the manufacture of union-bags and sail-cloth.* Patent dated June 12, 1855. (No. 1337.)

Claim.—"The mixture of jute and cotton in the manufacture of bags, petticoating, canvas for tents, or other similar articles, with a substitute for the ordinary temple, and the mixture of linen and cotton for sail cloth as described."

HACKNEY, N. *An improvement in the manufacture of earthenware, china, and porcelain.* Patent dated June 12, 1855. (No. 1338.)

Claim.—The application of native borate of lime in the manufacture of glaze used by earthenware, china, and porcelain manufacturers.

JOHNSON, W. B. *Improvements in steam boilers and safty-valves.* Patent dated June 12, 1855. (No. 1340.)

Claims.—1. In reference to attaching boiler tubes, compressing or contracting the end so as to form a shoulder, and expanding the said end within a conical aperture. 2. Forcing the end of the tube into a recess formed in the circumference of the aperture. 3. The use of rings of copper or other such metal as a caulking medium for boiler tubes. 4. In reference to safety valves, the use of two or more valves loaded by one lever, such valves being so arranged that one or more of them shall move in an opposite direction to the others.

PARKER, C. *Improvements in weaving.* Patent dated June 12, 1855. (No. 1342.)

This invention consists—1. Of a contrivance for obtaining a uniform and equal take-up of the cloth as it is woven, by the agency of a roller set or studded with pointed pins, which revolving points are in direct contact with the cloth that is being wound upon the take-up roller or beam. 2. In the adaptation of a screw movement for obtaining the necessary shifting traverse of the yarn or warp-beam lever weights ordinarily employed for producing a tensional drag upon the warp beam. The acting screw which shifts the lever weight is caused to rotate by being connected with the warp beam itself, the effect being, that as the diameter of the beamed warp gradually diminishes, the effective drag leverage is also correspondingly diminished by the weight being pushed near to the lever fulcrum, &c.

FORD, H. W. *Improvements in machinery or apparatus for effecting agricultural operations.* Patent dated June 12, 1855. (No. 1343.)

This invention consists in the construction of a peculiar locomotive engine, and in adapting thereto a digger, cleaning harrows, clod dividers, furrowers, revolving hoes, hay collectors, hay rakes, deep-drain diggers, &c.

BRANT, J. C. *Improvements in laying rails, chairs, and sleepers for the permanent way of railways.* Patent dated June 12, 1855. (No. 1344.)

This invention consists in the application of cork in various ways to the permanent way of railways; also in using longitudinal and transverse sleepers tied together so as to form a continuous line of way on a solid and equal bearing.

BAKEWELL, F. C. *Improvements in apparatus for supplying furnaces with hot air.* (A communication.) Patent dated June 13, 1855. (No. 1345.)

This invention consists in heating air to be supplied to furnaces for steam engines, or for other purposes, by forcing the air against the tubes through which the escape steam is passing.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

INGALL, G. H. *Improvements in coupling railway carriages.* Application dated June 4, 1855. (No. 1269.)

In this invention the carriages are coupled by a coupling link consisting of a right and left-handed screw, and ball and socket joints, so that the chains are in a state of tension in passing along curves of the railway as the chains move suitably upon rollers or pullies.

GRAVELEY, W. H. *An improved apparatus for cooking purposes, and improvements for the production of fresh water for ship and land use.* Application dated June 4, 1855. (No. 1271.)

This invention consists of a distilling apparatus arranged so as to combine distillation and cooking in one operation.

GEDGE, J. *Improvements in combs called curry-combs.* (A communication.) Application dated June 5, 1855. (No. 1277.)

Instead of the curry-comb now used the

inventor proposes to substitute one the band of which (without hammer or claw head) shall encase the ends of the blade combs, this sustaining band being strongly rivetted to the back plate, &c.

BARROWS, T. *Improvements in the treatment of wool preparatory to its being carded, spun, or woven.* Application dated June 5, 1855. (No. 1281.)

This invention consists in "the use of such mucilage from plants and seeds as is of a kind that retains moisture, does not readily dry, and yet can be mixed uniformly with oils."

TENWICK, J. *Improvements in water-gauges for steam boilers* Application dated June 5, 1855. (No. 1285.)

These improvements consist in making water gauges for steam boilers of metal, and glazing them in front, or at that part where the height of the water is to be shown.

NEWTON, W. E. *Improved machinery for rolling bar iron.* (A communication.) Application dated June 5, 1855. (No. 1286.)

The principal object of this invention is to roll railroad rails with three treads or wearing surfaces.

FIELDING, J., and W. HOPWOOD. *Improvements in looms.* Application dated June 6, 1855. (No. 1290.)

This invention relates primarily to that part of a loom technically called the check strap which works the picker, and consists in using a stud fixed to the front of the slay, with a groove in it for the strap to work on both ends of the spindle, in order to diminish the quantity of strapping used.

LOLMEDE, P. *A new instrument for the administration of medicinal substances.* Application dated June 6, 1855. (No. 1291.)

This instrument is used for introducing medicinal substances into the human body through the rectum intestine. It is of a cylindrical shape, and each end is rounded off, and at its periphery it is furnished with small recesses or cells for the purpose of containing the necessary pharmaceutical preparations.

LEECH, H., J. ROBINSON, and R. BURROWS. *Certain improvements in machinery or apparatus for spinning cotton and other fibrous substances.* Application dated June 6, 1855. (No. 1293.)

This invention relates to the general construction of self-acting mules, and consists in the substitution of a perpendicular or vertical movement or traverse, for the horizontal traverse of the ordinary mule carriage or spindle box.

OGDEN, T. *Certain improvements in machinery, or apparatus for spinning cotton and other fibrous materials.* Application dated June 7, 1855. (No. 1302.)

This invention relates to self-acting mules, and consists in causing the drawing rollers or front rollers to revolve slowly one or more times, and consequently to allow of the delivery of a small portion of the yarn whilst the spindle carriage is running in, so that the whole length of the thread which has been spun may be wound on to the spindle, whilst that portion of the thread which has thus been delivered by the partial revolution of the front roller will be ready to be similarly spun upon the return of the carriage. This is effected by means of a suitably-formed cam, which causes the rollers to be thrown into gear, and to make one or more revolutions at any required time before the carriage has completed its run.

ORANGE, A. *Improvements in obtaining representations for commercial purposes of articles for sale.* Application dated June 7, 1855. (No. 1303.)

The inventor proposes to photograph articles, samples, &c., and to exhibit the pictures obtained to purchasers and others.

FEHRMAN, D. *Improvements in lamps.* (A communication.) Application dated June 7, 1855. (No. 1305.)

In the improved lamp the flame impinges against a button by which it is caused to spread out so as to receive on its outward part a current of air which passes upward through a tube concentric with the wick-holder; air is also admitted through apertures in communication with the central part of the lamp.

CAUNCE, R. *Improvements in machinery for sizeing, dressing, and warping yarn.* Application dated June 8, 1855. (No. 1309.)

This invention consists in causing the yarn as it comes from the bobbins of a creel to pass through a row of hecks and then between rollers one of which revolves in a trough containing size. The yarns thus sized are operated upon by a brush and fan to dress and dry them; they then pass through another row of hecks and between a set of runners whence they go through guides and between a pair of rollers of the required width; the yarn is then wound on a fly or reel and is ready to be balled off by hand or to be wound on the weaver's beam. The length of the warp is measured and marked by an expanding and contracting wheel, and by a brush put in motion by one of the rollers by which it is delivered to the reel or fly.

WEAVER, F. *Improvements in machinery for grinding or crushing bones and other substances.* Application dated June 8, 1855. (No. 1311.)

This invention consists in employing a certain sliding plate in the top of a grinding mill, and certain clearers with a method of

adjusting them, each clearer being fixed and held by a set and lock pin.

SIBILLE, H. *Improvements in the decortication and preserving of grain and seeds.* Application dated June 9, 1855. (No. 1314.)

This invention consists in "removing by disintegration or decomposition, partly or entirely, the ligneous or outer pellicle of grain and seeds, by moistening the same with, or immersing them in, a caustic alkaline solution."

TEAGUE, H. *Improvements in high and low pressure meters for water, gas, or any other fluid.* Application dated June 9, 1855. (No. 1317.)

This invention mainly consists in placing between two hemispherical segments an elastic diaphragm composed of any suitable elastic material, and admitting the motive fluid alternately on each side of the diaphragm.

BAKEWELL, F. C. *Improvements in bench-planes.* (A communication.) Application dated June 11, 1855. (No. 1327.)

This invention consists of such an arrangement of the parts of a bench-plane that the chisel is placed in front of its wedge, and rests against the front shoulder, in the cavity of the plane, in combination with a mouth-piece countersunk on the face of the plane, in front of the edge of the chisel, to serve as a rest for the chisel, and to confine the throat of the plane.

CASARTELLI, J. L. *Improvements in pressure and vacuum gauges.* Application dated June 11, 1855. (No. 1329.)

The inventor uses two discs of metal put together so as to form a hollow chamber. The pressure is applied either to the external or internal surface, and produces a corresponding compression or extension, the amount of which is registered.

GARDNER, E. V., and J. H. WALKER. *Improvements in separating cotton, flax, hemp, jute, and other vegetable substances from manufactured fabrics containing wool, and in preparing the wool for re-manufacture.* Application dated June 11, 1855. (No. 1330.)

This invention consists in immersing manufactured fabrics containing wool in undiluted commercial sulphuric acid, of about 1·854 specific gravity, by which means the vegetable substances are prepared for solution, which is effected by immersing them in warm or cold diluted acid, or in warm or cold water.

PROVISIONAL PROTECTIONS.

Dated November 26, 1855.

2656. Denis Jonquet, of Mina-road, Old Kent-road, Southwark, Surrey, cutler. Improvements in the blades of mechanical cutting machines, and in the blades of single or doubled-handled cutting instruments, and in the blades of ordinary and mechanical shears and scissors, and in the handles and springs for the same.

Dated November 28, 1855.

2683. Charles Jean Baptiste Barbier, of Paris, France. An improved kiln for burning or firing pottery, bricks, tiles, and other earthenware.

2685. Benjamin Rosenberg, of New Charles-street, City-road, Middlesex, merchant. Improvements in protecting metallic and other surfaces from corrosion and decay. A communication.

2687. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in the manufacture of sand, emery, and glass papers, and in the machinery employed therein. A communication.

2689. Samuel Wolff, of Independence, Missouri, United States of America, physician. Improvements in obtaining motive power.

2691. Charles Clarke, of Farm-lane, Walham-green, Fulham, Middlesex. Improvements in applying roughings to the feet of horses.

Dated November 29, 1855.

2693. Thomas Symons, of Flushing, Cornwall. Improvements in the permanent ways of railways, and in the wheels rolling thereon.

2697. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved process of manufacturing hats. A communication.

2699. Pierre Louis Bergeon, manufacturer, of Paris, French empire. An improved spitting-box or spittoon. A communication.

Dated November 30, 1855.

2701. Henry Thomas Humphreys, of Kilmacow Mills, Waterford, Ireland, mill-owner, and James Loughry, of the same place, foreman miller. Improvements in machinery or apparatus for cleaning wheat.

2703. Auguste Dusautoy, of Boulevart des Italiens, Paris, France, and Regent-street, Middlesex. New and useful machinery for cutting cloth and other substances.

2705. Edward John Davis, of West Smithfield. Improvements in preparing food for horses and other animals.

Dated December 1, 1855.

2707. Edmund Alfred Pontifex, of Shoe-lane, London, engineer. Improvements in furnaces.

2709. William Needham and James Kite, of Vauxhall, Surrey, engineers. Improvements in machinery or apparatus for expressing liquids or moisture from substances.

2713. William Augustus Woodley, of the Lithographic and General Printing Offices, Taunton, Somerset. Improvements in the manufacture of paper bags.

Dated December 3, 1855.

2715. David Anderson, of Strandtown House, Down, Ireland, merchant. Improvements in machinery or apparatus for the preparation or manufacture of felt and other fibrous materials.

2719. William Rowan, of the firm of J. Rowan and Sons, of Belfast, Antrim, engineers. Improvements in steam-engines.

2721. Alexander Watt, of Dean-street, Soho, electro-metallurgist. An improvement in coating iron and steel with zinc.

Dated December 4, 1855.

2723. Samuel Garn, of Sevenhampton, Wiltshire,

wheelwright. An improved tipping apparatus applicable to carts and other vehicles.

2727. Joseph Barling, of High-street, Maidstone, Kent. An improvement in the manufacture of paper by the application of a root not before used for the purpose.

2729. William Knight, tailor, of St. Marylebone. An improved mode of cutting out or shaping materials to be employed in making over-coats or other similar articles of dress.

Dated December 5, 1855.

2731. Adam Bullough, of Blackburn, Lancaster, manufacturer. An improved lubricator for looms.

2733. William George Plunkett, of Belvidere-place, Dublin, gentleman, and John Bower, of Lower Ormond-quay, Dublin, civil engineer. The manufacture of fibres or threads for textile fabrics and cordage, also of paper, mill-board, and other similar boards from plants or portions of plants not hitherto used for these purposes.

2737. Cæsar Heilmann, of Milk-street, Cheapside, London, engineer. Improvements in grates or furnaces for steam-boilers.

Dated December 18, 1855.

2858. Christian Rudolph Wessel, of Fitzroy-square, New-road, Middlesex, gentleman, and George Bowden, of Little Queen-street, High Holborn, London, bookbinder. Joining elastic webbing into indissoluble bands.

2860. John Pierrpont Humaston, of Newhaven, United States, civil engineer. Improvements in instruments for composing and transmitting telegraph messages.

2862. David Lloyd Price, of Beaufort, Brecknock, electrical engineer. Improvements in electric telegraphs, and in appliances connected therewith as applied to railway trains and fixed stations.

2864. Hiram Hyde, of Truro, Nova Scotia, gentleman. An improved mode of purifying alcohol or alcoholic spirits. A communication.

2866. Edward Davies and John Milne Syers, of Liverpool, Lancaster, and Charles Humfrey, of Camberwell, Surrey, merchants. Improvements in distilling resinous, bituminous, fatty, and oily matters, and in the treatment of certain products therefrom.

2868. Frederick Robert Augustus Glover, of Bury-street, St. James, Middlesex, master of arts. Improvements in the construction of break-waters, sea-walls, and other structures or foundations of structures which lie partially or entirely under water.

Dated December 19, 1855.

2870. George Ross, of Birmingham, Warwick, engineer, and Thomas Wilkes, of Birmingham, machinist. New or improved machinery for the manufacture of bolts, rivets, spikes, screw-blanks, screws, nuts for screws, and washers.

2872. John Hadden, Henry Hadden, Frederick John Hadden, and Charles Staunton Hadden, of Nottingham, hosiers and copartners. Improvements in circular frames for the manufacture of ribbed fabrics.

2874. Henry Robert Abraham, of Howard-street, Strand, Middlesex. Improvements in carriages, and in certain appurtenances and appendages which belong to those used as hospital conveyances or ambulances.

Dated December 20, 1855.

2876. Robert Walker, of Eccleston, near Prescot, Lancaster, colliery viewer. Improvements in applying power to, and in machinery for raising and lowering coals, and other articles from and into mines.

2878. Andrew Shanks, engineer, of Robert-street, Adelphi, Westminster. Certain improvements in instruments for indicating pressures.

2882. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. Improvements in machinery for splitting leather. A communication.

2884. John Barcroft, of Hanley, Stafford, basket-maker. An improvement in the materials to be used in the manufacture of baskets and basket-work.

2886. Louis Rudolph Bodmer, of Thavies-inn, London. Improvements in hydraulic seed-crushing machines, or oil-presses.

Dated December 21, 1855.

2888. Jean Baptiste Emile Saffroy, banker, of Bordeaux, France. An improved break for railway-carriages. A communication.

2890. Thomas Edward Merritt, of Maidstone, Kent, gentleman. Improvements in breech-loading ordnance and fire arms.

2892. Matthew Tomlinson, of Ivy-house, Culcheth, Lancaster, manufacturer of medical plaister. An improved medical plaister.

2894. James Murdoch, of Staple-inn, Middlesex. Improvements in machines or apparatus for working chain stitch embroidery. A communication.

2896. Henry Francis, of West Strand, Middlesex, engineer. Improvements in apparatus for cutting out parts of garments.

2898. William Joseph Curtis, of Sebbon-street, Islington, civil engineer. Improvements in fog-signals, and in laying the same upon the rails of railways.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January 8th,* 1856.)

1935. Thomas Alexander Cooling. Improvements in pumps.

1947. Joseph Hopkinson, junior. Improvements in furnaces.

1959. Charles Frederick Stansbury. An improved changeable lock. A communication.

1961. John Juckes. Improvements in furnaces.

1971. Matthew Butcher and Thomas Henry Newey. An improvement or improvements in the manufacture of bobbins used in winding, twisting, and weaving fibrous substances.

1977. Thomas Symes Prideaux. Improvements in marine steam boiler furnaces and flues.

1979. Alfred Vincent Newton. Improvements in the manufacture of gas for illumination. A communication.

1982. Alfred Heaven. Improvements in embroidering fabrics.

1983. George Thomas Holden and Richard Nicholas. An improved roasting-jack.

1986. Edward Greene Jones. An improvement in flattening cylinders of sheet glass.

2004. Augustin Morel. Certain improvements in machinery for preparing fibrous materials to be combed or spun.

2016. Theodore Schwartz. An improvement in heating or cooling aeriform and liquid bodies.

2018. Charles Pryse and Paul Cashmore. Certain improvements in repeating fire-arms.

2023. Florentin Garand. Improvements in machinery for cutting veneers.

2026. John Stewart. Improvements in the construction of steam boilers for the more effectual consumption of smoke.

2036. Anguish Honour Augustus Durant. Improvements in apparatus for raising and lowering weights, and for saving persons and property from fire.

2038. Anguish Honour Augustus Durant. Improvements in apparatus for ascertaining the number of, and distance travelled by, passengers in public carriages.

2040. Anguish Honour Augustus Durant. Improvements in apparatus for sweeping and cleaning chimnies.

2044. Jean Panet. An improved hydraulic system for propelling on railways or obtaining motive power and distributing water.

2075. Théodore Gomme, junior, and Charles Eugène Auguste Beaugrand. Certain improvements in machinery for manufacturing copper and other metal wares.

2078. Frederick Stockes. Improvements in carriage springs.

2171. Joseph Mitchell. Improvements in buffers and draw springs used for railway and other purposes.

2189. Franz Uchatius. An improvement in the process of manufacturing cast steel.

2190. George Curling Hope. An improved method of producing figures, patterns, or designs upon textile fabrics for the purposes of needlework.

2304. Robert Benton. Improvements in obtaining motive power by leverage.

2476. Francis Hawkes the elder. Improvements in the construction and arrangement of water-closet apparatus.

2593. Joseph Denton. Improvements in looms.

2637. Charles Tennant Dunlop. Improvements in the manufacture or production of artificial oxide of manganese.

2656. Denis Jonquet. Improvements in the blades of mechanical cutting machines, and in the blades of single or double-handled cutting instruments, and in the blades of ordinary and mechanical shears and scissors, and in the handles and springs for the same.

2687. Richard Archibald Brooman. Improvements in the manufacture of sand, emery, and glass papers, and in the machinery employed therein. A communication.

2693. Thomas Symons. Improvements in the permanent ways of railways, and in the wheels rolling thereon.

2697. Alfred Vincent Newton. An improved process of manufacturing hats. A communication.

2737. Cæsar Heilmann. Improvements in grates or furnaces for steam boilers.

2798. Reuben Levy. An improvement in wearing apparel.

2848. Omrod Coffeen Evans. Improvements in digging-machinery.

2858. Christian Rudolph Wessel and George Bowden. Joining elastic webbing into indissoluble bands.

2860. John Pierrpont Humaston. Improvements in instruments for composing and transmitting telegraph messages.

2864. Hiram Hyde. An improved mode of purifying alcohol or alcoholic spirits. A communication.

2866. Edward Davies and John Milne Syers. Improvements in distilling resinous, bituminous, fatty, and oily matters, and in the treatment of certain products therefrom.

2882. George Tomlinson Bousfield. Improvements in machinery for splitting leather. A communication.

2886. Louis Rudolph Bodmer. Improvements in hydraulic seed-crushing machines, or oil-presses.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1852.

1182. James Webster.
1183. Claude Joseph Edmée Junot.
1186. John Copling, junior.
1192. Archibald Douglas Brown.
1206. Robert Taylerson.

1853.

11. John Bleackley, junior.
19. George Gwynne and George Fergusson Wilson.
21. Jean Baptiste Pascal.
25. Charles Frederick Whitworth.
26. Francis Edwards.
36. Robert Whinery.
39. William Edward Newton.
41. Peter Graham.
45. Thomas Pape.
75. John Petrie, junior, and Samuel Taylor.
92. William Brown.
125. Peter Fairbairn and Samuel Renny Mathers.
189. Alfred Vincent Newton.
240. William Edward Newton.
320. John Whitehouse, the elder, and John Whitehouse, the younger.
591. Edward Hammond Bentall.

LIST OF SEALED PATENTS.

Sealed December 28, 1855.

1992. William Armand Gilbee.
2003. William Armand Gilbee.
2196. Richard Threlfall and William Knowles.
2199. William Edward Newton.
2208. John Dickinson.
2215. Henry Cornforth.
2358. William Teall.
2432. Alfred Vincent Newton.
2468. Fennell Allman.
2482. Peter M'Gregor.

Sealed January 4, 1856.

1494. William Henry Tooth.
1500. George Guillaume.
1501. Georges Antoine Tabourin.
1534. Henry Crosley.
1547. James Hall Nalder.
1624. Robert Martin and John Cowdery Martin.
1680. Richard Archibald Brooman.
1682. Thomas Hewitt.
2060. James Higgin.
2492. Richard Threlfall and John Higson.
2546. John Henry Johnson.

Sealed January 8, 1856.

1536. John and Anton Bruno Seithen.

1537. François Loret-Vermeersch.
1541. Richard Archibald Brooman.
1553. Julius Jeffreys.
1554. John Adams.
1556. William Williams.
1567. Charles Byrne.
1574. Eugène Gillet.
1583. Louis Constant Joseph Poliesse, junior, and Charles Auguste Joseph Lengelée.
1593. Jean Baptiste Pascal.
1595. James Newman and William Whittle.
1616. John Ellis.
1621. Auguste Edouard Loradoux Bellford.
1626. Samuel Barlow Wright and Henry Thomas Green.
1649. Peter Armand Lecomte de Fontainemoreau.
1655. Samuel John Pittar.
1705. William Mardon.
1831. Lewis Normandy.
1963. William Gossage.
2089. Lewis Dunbar Brodie Gordon.
2129. Joseph Beattie.
2135. Alfred Vincent Newton.
2158. Josias Nottidge.
2168. James Good.
2175. Joseph Beattie.
2220. Edward Meldrum and James Young.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

CONTENTS OF THIS NUMBER.

Whitworth's Improvements in Ordnance, Fire-arms, Projectiles, and Machinery for Manufacturing the same—(*with engravings*) 25
Notæ Mathematicæ. By T. T. Wilkinson, F.R.A.S. No. IX. 27
Dr. Normandy's Improvements in Obtaining Fatty Acids and Soaps—(*with an engraving.*) 30
Minié's New Breech-loading Fire-arms...(*with engravings.*) 31
Professor Smyth's Improvements in Astronomical and Geodetical Instruments. 32
Morewood and Rogers' Improvements in Coating Iron. 33
British Patent Law for India 34
On some new Properties of freshly-calcined Charcoal. By M. Moride 35
New Ornamental Castings 35
The Cosmorama Stereoscope 36
"Papers and Practical Illustrations of Public Works of Recent Construction." (*Review.*) 36
"Letter on the Operations of the Smoke Nuisance Act." By C. Wye Williams. (*Review.*) 36
"The Factory Controversy; a Warning Against Meddling Legislation." By H. Martineau. (*Review.*) 38
Parker's Patent Smoke-Consuming Apparatus. 38
Phillips's Funeral Carriage 39
Liquid Fire and Spherical Shells 39
Specifications of Patents recently Filed:

Morton and Hunt	Motive Power Engines	39
Gedge	Preserving Grain	39
Gedge	Flat Tiles	39
Hopper	Shaping Metals	39
Robertson	Transmitting Power	39
Nunn	Invalids' Carriages	40
Boucher	Powder-Flasks	40
Baines	Railways	40
Favre	Crude Sodas	40
Ramsbottom	Safety Valves, &c.	46
Buncle	Soap	40
Heap	Grinding Dye Woods	40
Reynolds	Discharging Volleys	40
Guffroy	Furnaces	40
Tucker	Furnaces	40
Peters	Shells	41
Fontainemoreau	Iron Shovels	41
Lippmann	Leather	41
Chantrell	Charcoal	41
Nettlefold, Nettlefold, and Nettlefold	Locks	41
Lafond and Chatauvillard	Lighting	41
Varley	Electric Telegraphs	41
Bright	Fluid Supplies	41
Cooke	Preserving Provisions	41
Robinson	Tables	42
Greenwood	Purifying Oils	42
Colt	Fire-arms	42
Colt and Eley	Cartridges	42
Hall	Railway Breaks	42
Barlow	Fibrous Materials	42
Kind	Lock Spindles	42
Johnson	Governors	42
Lippmann	Dyeing Skins	42
Liebisch	Railways	42
Armitage	Union-bag	43
Hackney	Earthenware, &c.	4?
Johnson	Steam Boilers	43
Parker	Weaving	43
Ford	Agricultural Apparatus	43
Brant	Permanent Way	43
Bakewell	Furnaces	43

Provisional Specifications not proceeded with:

Ingall	Couplings for Carriages	43
Graveley	Cooking Apparatus	43
Gedge	Curry-combs	43
Barrows	Wool	44
Tenwick	Water-gauges	44
Newton	Rolling Bar Iron	44
Fielding and Hopwood	Looms	44
Lolmede	Medical Instrument	44
Leech, Robinson, and Burrows	Spinning	44
Ogden	Spinning	44
Orange	Photographing Samples	44
Fehrman	Lamps	44
Caunce	Yarn	44
Weaver	Grinding Bones	44
Sibille	Preserving Grain	45
Teague	Meters	45
Bakewell	Bench-planes	45
Casartelli	Pressure Gauges	45
Gardner and Walker	Separating Wool from Fabrics	45

Provisional Protections 45
Notices of Intention to Proceed 46
Patents on which the Third Year's Stamp Duty has been Paid 47
List of Sealed Patents 47

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1693.] SATURDAY, JANUARY 19, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

PETERS' IMPROVED STEAM ENGINES.

Fig. 6. Fig. 10. Fig. 7. Fig. 11.

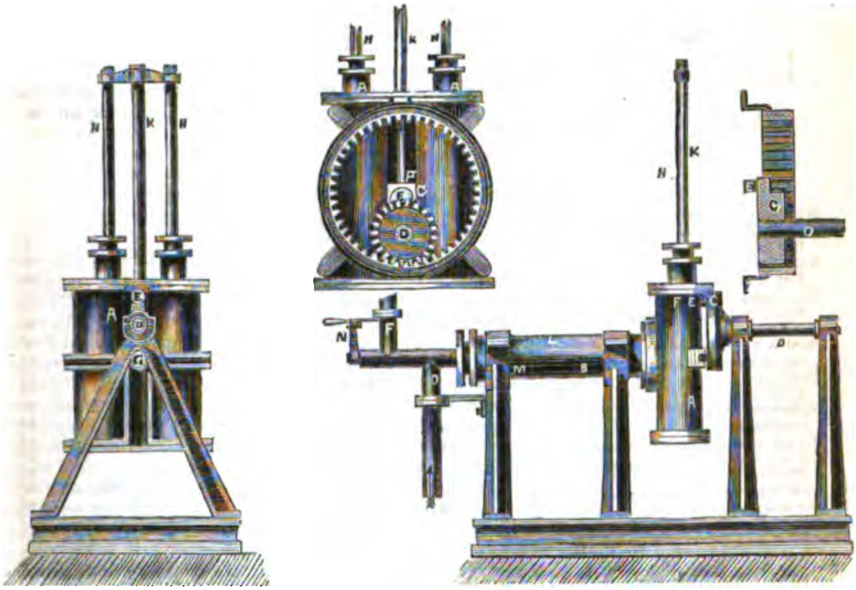
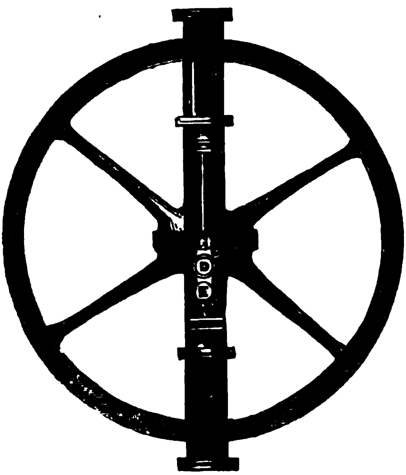
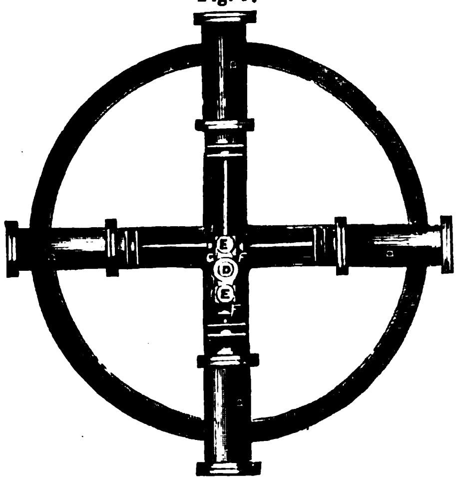


Fig. 8. Fig. 9.





PETERS' IMPROVED STEAM ENGINES.

MR. PETERS, engineer, of Southwark, whose machinery for the manufacture of hollow projectiles was described at page 578 of our last volume (No. 1689), has recently invented, and has now working at his factory, a steam engine of an altogether novel construction, in which is adopted such a combination and arrangement of parts as will produce one revolution or rotation of the crank and its shaft by a single stroke of the piston of the steam cylinder, instead of requiring, as in ordinary engines, an up and down stroke, or a double stroke of the piston. This is effected by making the stroke of the piston twice the ordinary proportional length, that is, four times the length or radius of the crank, and by suspending the cylinder on an axis of motion upon which it is free to rotate. He also so places the crank shaft that its centre of motion may be eccentric to the axis of the cylinder to the extent of one quarter of the stroke of the piston, or the radius of the crank; and connects the actuating rod of the piston with the crank-pin by means of a bush fixed on that rod, and working or sliding in a groove or grooves, or other convenient guides attached to the cylinder, and passing through or intersecting its axis of motion. He further uses one or more of these cylinders, as convenience may dictate, the combined forces of which he causes to act upon the crank-shaft in a manner hereafter described.

He prefers to use double cylinders, fitted with a hollow axis, through which the steam may be conveyed to and from the cylinders; and within a chamber at the termination of the hollow axis he places a fixed circular disc or plate slide, having apertures in it for the passage of the steam simultaneously to and from both cylinders, and working against a suitable face on their side. He connects the ends of the piston rods together by a cross head, from the centre of which a rod passes between the cylinders, and is connected with a bush or block, which is fitted on to the crank pin and slides, or is guided in a groove between the cylinders, such bush moving simultaneously with the pistons, and by its rectilinear action in the direction of the length of the cylinders causes the crank pin to rotate once round its own axis during the period of one single stroke of the pistons; and having completed one such rotation, its motion is continued by the steam passages being reversed by the action of the slide, producing the retrograde motion of the pistons and another or second rotation of the crank. The necessary consequence of this motion of the crank is the rotation of the cylinders round their common axis, on which they are poised, the cylinders thus serving the purpose of a fly wheel. The continued action of the steam produces a continuous reciprocation of the pistons, and consequently a continuous rotation of the crank at twice the speed ordinarily obtained from the action of the pistons on the crank. In consequence of the combined rotation of the cylinders and crank, there is one only dead point in the revolution of the crank instead of two, as in the ordinary construction of engine.

The reversing action is simply effected by moving the circular slide partially round its axis by means of a lever, which is retained in the required position by a stop, thus avoiding the complication, friction, and expense of the ordinary slide gear. To insure a more perfect and uniform action, the crank is made with a double arm, and is fitted with two pins, the one connected with the sliding bush in the longitudinal groove or guide, as already described, and the other fitting or sliding in a groove or guide on the cylinders, placed at right angles to the longitudinal guide or length of the cylinders, and intersecting their axis of motion. It is not, however, absolutely necessary to adopt the second or guide pin and lateral groove to effect the simultaneous rotation of the crank and cylinders, and consequently the double speed of the crank, as an internal toothed wheel attached to the cylinders, and a pinion attached to the crank shaft working in concert with it, will effect the same object; but the former possesses the greatest simplicity of arrangement, and whether one cylinder, twin cylinders, or two distinct and independent cylinders be employed to give motion to the crank, or a combination of several series of cylinders be used, the same effect is produced on the crank, viz., the double rotation for the up and down stroke of each respective series of pistons, the number of such series being merely a question of the amount of power concentrated on the crank shaft.

Figs. 1, 2, 3, 4, 5 of the accompanying engravings are diagrams illustrative of the principle of action developed in this invention. Figs. 6, 7, 8, 9 show applications of the invention to steam engines having respectively two and four cylinders. Figs. 10 and 11 show an application of the invention in which an internal wheel and pinions is used for effecting the double motion of the crank shaft. In figs. 1, 2, 3, 4, and 5 the diagrams represent the relative positions of the cylinders and crank at the four quarters of the stroke of the piston respectively, viz.: fig. 1, when the pistons are at the bottom of the cylinders and commencing the stroke, A, B, being the line of the piston's motion, turning on a centre, C; and D, the pin of the crank, rotating round a centre, E; fig. 2, the same at the first quarter of the stroke; fig. 3, the same at half stroke; fig. 4, the same at three quarters of the stroke; and fig. 5, the same at the full stroke, the arrow head in each case showing the direction of

the piston's motion. Referring to figs. 6 and 7, A, A are two cylinders, rotating round an axis, B, having grooves, *a*, *a*, at right angles to each other, and turning in a suitable frame and bearings; C is a crank; D, the crank shaft, mounted in a frame with suitable bearings; E, the crank pin; F, the sliding bush; G, the guide pin; H, H are the piston rods, united by a cross head, I, and connected with the bush, F, by a rod K; L is a hollow axis

Fig. 1. Fig. 2. Fig. 3.

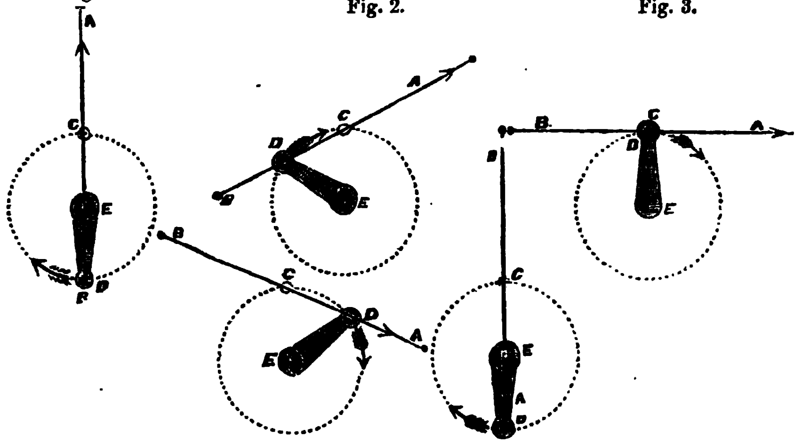


Fig. 4. Fig. 5.

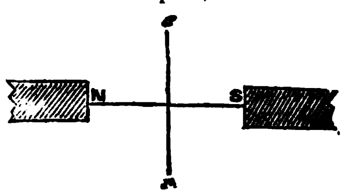
or tube attached to the cylinders with which it rotates; within it is contained a hollow stem or tube, M, terminating in a disc or plate slide, which seats against the face of the ports of the cylinders, having suitable apertures for the passage of the steam. The slide is held in its position and prevented from turning by a lever, N, and suitable stops at the end of the frame, and is capable of being moved round its centre to a sufficient extent to change the communication with the passages of the cylinders, and so to reverse the motion of the pistons. The steam is admitted through a branch, O, of a pipe which is made steam-tight in a packed stuffing box formed in the end of the axis, L, and is discharged through a similar branch, P, the branches being separated by the intervention of two collars inserted in the branch pipe, and seated against conical shoulders on the tube, M, through which the steam is discharged from the cylinders. Ordinary slides with a fixed eccentric may be used for the supply of steam to the cylinders, but Mr. Peters prefers that before described, as being simpler in construction, and as dispensing with the eccentric rods and extra joints of the slide cases, &c. The actions of all the engines shown are alike, with the exception that in fig. 9 a double series of cylinders on a two-throw crank produces a more uniform power by causing the action of one series to be at its maximum when that of the other is at its minimum.

FARADAY'S EXPERIMENTAL RESEARCHES IN ELECTRICITY.

(*Continued from page* 9.)

The second series of "Researches" in the present volume contains the discovery of *diamagnetism*; or, at least, the discovery of its very general nature and wide-spread influence, thus extending the property formerly observed in bismuth by M. La Baillif to a very large number of different substances, of which, however, bismuth is the most striking in its action.

N and S are the north and south poles of a magnet. Then if a needle of iron, steel, nickel, or any of what are called *magnetic* bodies, be placed between the two poles, it will assume a direction parallel to NS (which Faraday proposes to designate the *axial* direction.) But if a needle of bismuth be placed between the poles, it will assume a



position *at right angles* to NS, and rest in the line, *er*, which Faraday calls the *equa-*

torial direction. All the space between the poles of the magnet is called the *magnetic field.* Not only bismuth, but a vast variety of substances are thus found to take up the *equatorial* direction, when acted on by a sufficiently powerful magnet. The following is Faraday's list of these "diamagnetics." Bismuth, antimony, copper, gold, tin, zinc, lead, mercury, silver, cadmium, amongst the metals. Of other classes of substances, the following were found to possess the property in a greater or less degree: Rock crystal, alum, water, alcohol, glass, sealing-wax, wood, mutton, beef, sugar, caoutchouc, ivory, bread, leather, and a long list of others, including both solids and fluids. The fluids were enclosed in glass tubes in order to be experimented on. "Flint-glass points equatorially, but if the tube be of very thin glass, this effect is found to be small when experimented with alone; afterwards, when it is filled with liquid and examined, the effect is such that there is no fear of mistaking that due to the glass for that of the fluid. The tubes must not be closed with cork, sealing-wax, or any ordinary substance taken at random, for these are generally magnetic. I have usually so shaped them in the making and drawn them off at the neck, as to leave the aperture on one side, so that when filled with liquid they require no closing."(p. 35.)

In order to show these phenomena, "magnetic apparatus of great power and under perfect command," is required. The substances to be tried were shaped into the form of bars, and delicately suspended between the poles of the magnet by fine threads or wires.

Referring to the list above given, Faraday says:—"It is curious to see such a list of bodies as this, presenting on a sudden this remarkable property; and it is strange to find a piece of wood, or beef, or apple, obedient to or repelled by a magnet. If a man could be suspended with sufficient delicacy, after the manner of Dufay, and placed in the magnetic field, he would point equatorially; for all the substances of which he is formed, including the blood, possess this property." (p. 36.)

"The setting equatorially depends upon the form of the body, and the diversity of form presented by the different substances in the list was very great; still the general result, that elongation in one direction was sufficient to make them take up an equatorial position, was established. It was not difficult to perceive that comparatively large masses would point as readily as small ones, because in larger masses more lines of magnetic force would bear in their action on the body, and this was proved to be the case. Neither was it long before it evidently appeared that the form of a plate or ring was quite as good as that of a cylinder or a prism; and in practice it was found that plates and flat rings of wood, spermaceti, sulphur, &c., if suspended in the right direction, took up the equatorial position very well. * * * *

"I do not find that division of the substance has any distinct influence on the effects. A piece of Iceland spar was observed, as to the degree of force with which it set equatorially; it was then broken into six or eight fragments, put into a glass tube, and tried again; as well as I could ascertain, the effect was the same.

"By a second operation, the calcareous spar was reduced into coarse particles, afterwards to a coarse powder, and ultimately to a fine powder. Being examined as to the equatorial set each time, I could perceive no difference in the effect until the very last, when I thought there might be a slight diminution of the tendency, but if so it was almost insensible." (pp. 36-7.)

But the most curious and interesting of the effects observed by Faraday are those presented by *copper*. An accurate examination of them would take up too much of our space; and we must therefore refer our readers who are interested in the subject to Faraday's own description. The peculiar effects in question depend on the rapid formation and cessation of electric currents in the copper by the influence of the magnet, are due, in fact, to "magneto-electric induction," of which Faraday has given ample account in his former "Researches."

Several years ago it was thought by some philosophers that *all* bodies were *magnetic*, that is, as *iron* is. "These new facts," says Faraday, "give not a mere negative to this statement, but something beyond, viz., an affirmative as to the existence of forces in all ordinary bodies, directly the opposite of those existing in magnetic bodies; for whereas those practically produce attraction, these produce repulsion; those set a body in the axial direction, but these make it take up an equatorial position; and the facts with regard to bodies generally are exactly the reverse of those which the view quoted indicates." (p. 38.)

The third series of the "Researches" in this volume (being the twenty-first of the *whole* "Series,") is on the action of magnets upon magnetic metals and their compounds, and upon air and gases.

"(2343.) The magnetic characters of iron, nickel, and cobalt, are well known, and also the fact that at certain temperatures they lose their usual property, and become, to ordinary test and observation, non-magnetic; then entering into the list of diamagnetic bodies, and acting in like manner

with them. Closer investigation, however, has shown me that they are still very different to other bodies, and that though inactive when hot on common magnets or to common tests, they are not so absolutely, but retain a certain amount of magnetic power whatever their temperature; and also that this power is the same in character with that which they ordinarily possess.

"(2344.) A piece of iron wire, about 1 inch long and 0·05 of an inch in diameter, being thoroughly cleaned, was suspended at the middle by a fine platinum wire connected with the suspending thread, so as to swing between the poles of the electro-magnet. The heat of a spirit-lamp was applied to it, and it soon acquired a temperature which rendered it quite insensible to the presence of a good ordinary magnet, however closely it was approached to the heated iron. The temperature of the iron was then raised considerably higher by adjustment of the flame, and the electro-magnet thrown into action. Immediately the hot iron became magnetic, and pointed between the poles. The power was feeble, and in this respect the state of the iron was in striking contrast with that which it had when cold, but in character the force was precisely the same.

"(2345.) The iron was then allowed to fall in temperature slowly, so that its assumption of the higher magnetic condition might be observed. The intensity of the force did not appear to increase until the temperature arrived near a certain point, and then as the heat continued to diminish, the iron rapidly, but not instantaneously, acquired its high magnetic power; at which time it could not be kept from the magnet, but flew to it, bending the suspending wire, and trembling as it were with magnetic energy as it adhered by one end to the core.

"(2346.) A small bar of nickel was submitted to an experimental examination in the same manner. This metal, as I have shown, loses its magnetism as respects ordinary tests at a heat below that of boiling oil, and hence it is very well fitted to show whether the magnetic metals can have their power entirely removed by heat or not; and also whether the disappearance of the whole or greater portion of their power is sudden or gradual. The smallness of the mass to be experimented on assisted much in the determination of the latter point. Upon being heated, the nickel soon became indifferent to ordinary magnets; but however high the temperature, still it pointed to, and was attracted by, the electro-magnet. The power was very feeble, but certain. It was scarcely enough to sustain the weight of the nickel by the magnetic action alone, but was abundantly evident when the metal was supported as described in (2344.)

"(2347.) On carefully lowering the temperature of the nickel, it was again found that the transition from one degree of magnetic force to the other was progressive, and not instantaneous. * * * *

"(2348.) I have expressed an opinion founded on the different temperatures at which the magnetic metals appeared to lose their peculiar power, that all the metals would probably have the same character of magnetism if their temperature could be lowered sufficiently.—("Experimental Researches," vol. ii., pp. 217, 225.) The facts just described appear to me entirely against such an opinion. The metals which are magnetic retain a portion of their power after the great change has been effected, or in what might be called their diamagnetic state; but the other metals, such as bismuth, tin, &c., present no trace of this power, and therefore are not in the condition of the heated iron, nickel, or cobalt; for, in fact, whilst these point axially, and are attracted, the others point equatorially and are repelled. I therefore hope to be allowed to withdraw the view I then put forth.

"(2349.) I next proceeded to examine the peroxides of iron, and in accordance with the observations of M. Becquerel and others, found them all, both natural and artificial, possessed of magnetic power at common temperatures. I heated them in tubes, but found them still magnetic, suffering *no* diminution of the force by such temperature as I could apply to them.

"(2350.) Different specimens of the oxide of nickel were found to present the same phenomena. They were magnetic both when hot and cold; and that heat should cause no change in this respect is the more striking, because the hot oxide had a temperature given to it far higher than that necessary to produce the great magnetic change in the metal itself.

"(2351.) The oxide of cobalt also was magnetic, and equally magnetic whether hot or cold. Glass coloured blue by cobalt is magnetic in consequence of the presence of the oxide of that metal, and is so whether hot or cold. In all these cases the degree of power retained was very small compared to that of the pure metal." (pp. 54—56.)

The *salts* of iron, such as the protochloride, perchloride, iodide, proto-sulphate, nitrate, &c., &c., were also found magnetic. Green bottle glass is comparatively very magnetic from the iron it contains, and cannot be used as tubes to hold other substances. Crown glass is magnetic from the same cause. Flint glass is not magnetic, but points equatorially.

Some of the most curious and interesting of the facts described under this head by Faraday, are those presented by tubes con-

taining solutions of the magnetic salts, themselves being contained and suspended within stronger or weaker solutions of the same salts. "According to my hopes," says Faraday, "even the solutions of the ferruginous salts, whether in water or alcohol, were magnetic. A tube filled with a clear solution of proto—or persulphate of iron, or proto—or perchloride or tincture of muriate of iron, was attracted by the poles, and pointed very well between them in the axial direction.

"(2357.) These solutions supply a very important means of advancing magnetical investigation, for they present us with the power of making a magnet, which is at the same time liquid, transparent, and, within certain limits, adjustible to any degree of strength. Hence the power of examining a magnet optically. Hence also the capability of placing magnetic portions of matter one within another, and so observing dynamic and other phenomena within magnetic media. In fact, not only may these substances be placed as magnets in the magnetic field, but the field generally may be filled with them, and then other bodies and other magnets examined as to their joint or separate actions in it. * * * *

"(2362.) A clear solution of the protosulphate of iron was prepared, in which one ounce of the liquid contained seventy-four grains of the hydrated crystals; a second solution was prepared containing one volume of the former and three volumes of water; a third solution was made of one volume of the stronger solution, and fifteen volumes of water. These solutions I will distinguish as Nos. 1, 2, and 3; the proportions of crystals of sulphate of iron in them were respectively as 16, 4, and 1 per cent. nearly. These numbers may therefore be taken as representing, generally only, the strength of the magnetic part of the liquids.

"(2363.) Tubes like that before described (2279) were prepared and filled respectively with these solutions, and then hermetically sealed, as little air as possible being left in them. Glasses of the solution were also prepared, large enough to allow the tubes to move freely in them, and yet of such size and shape as would permit of their being placed between the magnetic poles. In this manner the action of the magnetic forces upon the matter in the tubes could be examined and observed, both when the tubes were in diamagnetic media, as air, water, alcohol, &c., and also in magnetic media, either stronger or weaker in magnetic force than the substances in the tubes.

"(2364.) When these tubes were suspended in air between the poles, they all pointed axially or magnetically, as was to be expected, and with forces apparently proportionate to the strengths of the solutions. When they were immersed in alcohol or water, they also pointed in the same direction; the strongest solution very well, and also the second, but the weakest solution was feeble in its action, though very distinct in its character.

"(2365.) When the tubes immersed in the different ferruginous solutions were acted upon, the results were very interesting. The tube No. 1, (the strongest magnetically), when in solution No. 1, had no tendency, under the influence of the magnetic power, to any particular position, but remained wherever it was placed. Being placed in solution No. 2, it pointed well axially, and in solution No, 3, it took the same direction, but with still more power.

"(2366.) The tube No. 2, when in the solution No. 1 pointed equatorially, that is, as heavy glass, bismuth, or a diamagnetic body generally in air. In solution No. 2 it was indifferent, not pointing either way; and in solution No. 3 it pointed axially, or as a magnetic body. The tube No. 3 containing the weakest solution, pointed equatorially in solutions Nos. 1 and 2, and not at all in solution No. 3.

"(2367.) Several other ferruginous solutions, varying in strength, were prepared, and as a general and constant result, it was found that any tube pointed axially if the solution in it was stronger than the surrounding solution, and equatorially if the tube solution was the weaker of the two.

"(2368.) The tubes were now suspended vertically, so that being in the different solutions they could be brought near to one of the magnetic poles, and employed in place of the indicating tube or sphere of bismuth or heavy glass (2266). The constant result was, that when the tube contained a stronger solution than that which surrounded it, it was attracted to the pole, but when its solution was the weaker of the two, it was repelled. The latter phenomena were, as to appearance, in every respect the same as those presented in the repulsion of heavy glass, bismuth, or any other diamagnetic body in air." (pp. 58—60.)

From these experiments, then, it appears that if a substance which would point axially, or as a magnetic body, between the poles of a magnet, if suspended in air, were surrounded by a medium of greater magnetic power, it would point equatorially, and be repelled instead of pointing axially and being attracted; that is, it would appear to be a *diamagnetic* instead of a *magnetic* substance. It is immediately obvious from this, that no certain inferences can be drawn as to the nature of a substance thus experimented on, with regard to its *magnetic*

or *diamagnetic* properties, unless we know whether the *medium* in which it is placed, or the substance by which it is surrounded, be itself a magnetic substance of greater or weaker force. It will occur, then, at once to the mind, to ask whether the *air* or *water*, or other substance in which bodies are suspended, be themselves possessed of any distinct magnetic properties of their own. This inquiry, especially necessary in the case of atmospheric air, was what Faraday next undertook, and the result of which we shall now give in his own words.

"(2400.) It was impossible to advance in an experimental investigation of the kind now described, without having the mind impressed with various theoretical views of the mode of action of the bodies producing the phenomena. In the passing consideration of these views, the apparently middle condition which *air* held between magnetic and diamagnetic substances was of the utmost interest, and led to many experiments upon its probable influence, which I will now proceed briefly to describe:

"(2401.) A thin flint-glass tube, in which common air was hermetically enclosed, was placed between the magnetic poles, surrounded by air, and the effect of the magnetic force observed upon it. There was a very feeble tendency of the tube to an equatorial position, due to the substance of the tube in which the air was enclosed.

"(2402.) The air was then withdrawn from around the tube, more or less, and at last up to the highest amount which a good air-pump would effect; but whatever the degree of rarefaction, the tube of air still seemed to be affected exactly in the same manner as if surrounded by air of its own density.

"(2403.) I then surrounded the air-tube with hydrogen and carbonic acid in succession; but in both these, and in each of them at different degrees of rarefaction, the tube of air remained as indifferent as before.

"(2404.) Hence there appears to be no sensible distinction between dense or rare air; or, as far as these experiments go, between one gas or vapour and another.

"(2405.) As it did not seem at all unlikely that the equatorial and axial *set* of bodies, or their repulsions and attractions, might depend upon converse actions of the media by which they were surrounded (2361), so I proceeded to examine what would occur with diamagnetic substances when the air or gas which surrounded them was changed in its density or nature, or what would happen to air itself when surrounded by these substances.

"(2406.) The air-tube (2401) was suspended horizontally in water (being retained below the surface by a cube of bismuth attached to it, just beneath the point of suspension, which therefore could have no power of giving it direction); it was then subjected to the magnetic forces, and immediately pointed well in an axial direction, or as a magnet would have done. Being brought near to one pole, it moved, on the supervention of the magnetic force, appearing as if *attracted* after the manner of a magnetic body; and this continued as long as the magnetic force was sustained in action.

"(2407.) The air-tube was in like manner subjected to the action of the magnetic force, when surrounded by alcohol, and also by oil of turpentine, with precisely the same results as in water. In all these cases, the action of air in the fluids was precisely the same as the action of a magnetic body in air. The air-tube was subjected to the action of the magnet even when under the surface of mercury, and here also it pointed axially.

"(2408.) In order to extend the experimental relations of air and gases, I proceeded to place substances of the *diamagnetic* class in them. Thus the bar of heavy glass was suspended in a jar of air, and then the air about it more or less rarefied, but as before, in the case of the air-tube (2402), alterations of this kind produced no effect. Whether the bar were in air at the ordinary pressure, or as rare as the pump could render it, it still pointed equatorially, and apparently always with the same degree of force." Similar results were obtained with a bar of bismuth.

"(2411.) The perpendicular copper bar (2323) was suspended near the magnetic pole *in vacuo*, but its set, sluggish movements and revulsion were just the same as before in air (2324).

"(2412.) The following preparations in tubes, namely, a vacuum, air, hydrogen, carbonic acid gas, sulphurous acid gas, and vapour of æther, were surrounded by water, and then subjected to the magnetic force; they all pointed axially, and as far as I could perceive, with equal force. Being placed in alcohol, the same effect occurred.

"(2413.) The same preparations being surrounded by air, or by carbonic acid gas, all set equatorially.

"(2414.) The axial position of the tubes in the liquid (2412) depends, doubtless, upon the relation of the contents of the tube to the surrounding medium; for, as far as the matter of the tube is concerned, it alone would have tended to give the equatorial position. In the following succeeding experiment (2413), where the tubes of gases were in surrounding gases, the equatorial position is due to the effect of the glass of the tube; and that it should

produce its constant feeble effect, undisturbed by all the variations of the gases and vapours, is a proof how like and how indifferent these are one to the other. * * *

"(2416.) In every kind of trial, therefore, and in every form of experiment, the gases and vapours still occupy a medium position between the magnetic and the diamagnetic classes. Further, whatever the chemical or other properties of the substances, however different in their specific gravity, or however varied in their own degree of rarefaction, they all became alike in their magnetic relation, and apparently equivalent to a perfect vacuum. Bodies which are very marked as diamagnetic substances, immediately lose all traces of this character when they become vaporous. It would be exceedingly interesting to know whether a body from the magnetic class, as chloride of iron, would undergo the same change."

(*To be continued.*)

INSTITUTION OF CIVIL ENGINEERS.

ADDRESS BY ROBERT STEPHENSON, ESQ., M.P., PRESIDENT, JANUARY 8, 1856.

The President, on taking the chair for the first time since his election, handed in an address, which was read by the Secretary.

After a complimentary allusion to the addresses of his predecessors, the president observed, that he would apply himself to the great question of British railways, which were described as spreading, like a network, over Great Britain and Ireland, to the extent of 8,054 miles completed;—thus, in length, they exceeded the ten chief rivers of Europe united, and more than enough of single rails were laid to make a belt of iron around the globe.

The cost of these lines had been £286,000,000, equal to one-third of the amount of the national debt. Already, in two short years, there had been spent more than one-fourth of 286 millions, in the war in which England was engaged.

The extent of the railway works was remarkable; they had penetrated the earth with tunnels to the extent of more than 50 miles; there were 11 miles of viaduct in the vicinity of the metropolis alone; the earthworks measured 550,000,000 of cubic yards; St. Paul's, in comparison with the mountain this earth would rear, would be but as a pigmy beside a giant, for it would form a pyramid a mile and-a-half in height, with a base larger than St. James's-park.

Eighty millions of train miles were run annually on the railways, 5,000 engines, and 150,000 vehicles composed the working stock; the engines, in a straight line, would extend from London to Chatham; the vehicles, from London to Aberdeen; and the companies employed 90,400 officers and servants; whilst the engines consumed annually 2,000,000 tons of coals, so that in every minute of time 4 tons of coal flashed into steam 20 tons of water,—an amount sufficient for the supply of the domestic and other wants of the town of Liverpool. The coal consumed was almost equal to the whole amount exported to foreign countries, and to one-half of the annual consumption of London.

In 1854, 111 millions of passengers were conveyed on railways; each passenger travelling an average of 12 miles. The old coaches carried an average of 10 passengers, and for the conveyance of 300,000 passengers a-day 12 miles each, there would have been required at least 10,000 coaches and 120,000 horses.

The receipts of the railways in 1854 amounted to £20,215,000, and there was no instance on record in which the receipts of a railway had not been of continuous growth, even where portions of its traffic had been abstracted by competition, or new lines.

The wear and tear was great; 20,000 tons of iron required to be replaced annually; and 26 millions of sleepers annually perished; 300,000 trees were annually felled to make good the loss of sleepers; and 300,000 trees could be grown on little less than 5,000 acres of forest land. The president considered, at some length, how these annual depreciations should be met. The principle of a renewal fund was questionable. After a certain period in the history of every railway, deterioration reached an annual average, and as that annual depreciation became a charge, as fixed and certain as the cost of fuel, or the salaries of officers, it should be admitted as an annual charge against receipts.

As regarded fares, the interests of the companies and of the public were identical; companies must regulate fares, by consideration of the circumstances which produced the largest revenue, and the circumstances which produced the largest revenue were those which induced the greatest number of individuals to travel. Nothing was so profitable as passenger traffic, as it cost less in every way than goods, and an average train would carry 200 passengers. The cost of running a train was overstated at 15 pence per mile, and 100 passengers at five-eighths of a penny per mile produced 5*s.* 2½*d.* But this argument did not imply that, in all cases, fares should be fixed at a minimum. Minimum fares were most profitable on short routes; but the public were too much

occupied to be tempted by minimum fares to undertake long journeys. High rates of speed, and increased comforts were then required, and these might be charged for.

The Postal Facilities afforded by railways were very great. But for their existence, Mr. "Rowland Hill's" plan never could have been effectually carried out. Railways afforded the means of carrying bulk, which would have been fatal to the old mail coaches. Nevertheless, the post-office did not appear to treat railways with all the consideration they were entitled to expect. Great services were required, and in return it had been contended, that no profit should be allowed to the railway companies except as carriers and workers of the line. Railway companies were therefore indifferent to postal traffic; which was shown to be a serious disadvantage to the public. At present, the post-office competed with railways, as carriers of book parcels, a principle which might be extended still further, but not without injustice and hardship to the railways.

Parliamentary legislation for railways was full of incongruities and absurdities, which were graphically described and illustrated. The remedy which suggested itself for this state of things, was one which Parliament was not likely to grant. A competent tribunal was wanted; and Parliament was incompetent. Neither its practical experience, its time, nor its system, were adapted for railway legislation. If a mixed commission could be organized, to consist of practical men of acknowledged legal, commercial, and mechanical ability, there might be some chance of railway business being efficiently conducted: but it was admitted that there was little hope of any such concession.

Railway management was next considered, and shown to be completely anomalous. Parliament had legislated for railways as toll-taking companies; but every direction was obliged to embark in enterprises foreign to the parliamentary objects of the railway itself. This produced serious dilemmas. As long as dividends were kept up, the directors were popular, however illegal their acts; but the moment the dividends fell, the directors, however energetic, wise, or prudent, were visited by the shareholders and the public with all the penalties of having exceeded the letter of the law. Men whose reputations were at stake were, consequently, unwilling to incur the risk of becoming railway directors; and the most enlightened managers and shareholders were revolving in their own minds how the dilemma could be escaped. It was suggested, that advantage might be taken of the Limited Liability Act, or of some analogous measure, to enable a limited number of men of business to take lines of railway from shareholders, on leases, subject to certain conditions and terms. A few of the lessees would then constitute themselves managers; and, being free from apprehensions, on account of shareholders,—of external interference, or of personal liabilities, they would be able fully to work the line, and enter into those enterprises necessary for its development, and essential to its prosperity. A large profit would accrue to those who took the line, and managed it with vigour and economy; whilst shareholders would derive great advantages from the certainty of receiving fixed dividends, and from the enhancement of the value of their property, and practical security would be afforded to the public, whilst their best interests would be consulted.

The Electric Telegraph—that offspring and indispensable companion of railways—was next considered. 7,200 miles of telegraph, or 36,000 miles of wires, were laid down at least. 3,000 people were continually employed, and more than a million of public messages were annually flashed along this "silent highway." To the working of railways, the telegraph had become essential. Some statistics were given, to show that the business of the Electric Telegraph Company had increased fifty-fold in seven years.

Railway accidents occurred to passengers in the first half of 1854, in the proportion of one accident to every 7,195,343 travellers. Ladies and gentlemen could scarcely "sit at home at ease" with the impunity with which, it appeared, that they could travel by railway. Yet Parliament had seen fit to legislate expressly for accidents by railway, without legislating in the same way for accidents from other sorts of locomotion. This was unfair to railways, and ill-calculated to afford protection to the public where it was most needed.

The results of railways were astounding: 90,000 men were employed directly, and upwards of 40,000 collaterally; 130,000 men, with their wives and families, represented a population of 500,000 souls; so that 1 in 50 of the entire population of the kingdom might be said to be dependent upon railways! The annual receipt of railways now reached 20 millions; or nearly half the amount of the ordinary revenue of the state. If railway intercourse were suspended, the same amount of traffic could not be carried on under a cost of 60 millions per annum; so that 40 millions a-year were saved by railways. To the public "time is money," and, in point of time, a further saving was effected; for on every journey averaging 12 miles in length, an

hour was saved to 111 millions of passengers per annum, which was equal to 38,000 years in the life of a man, working 8 hours a-day; and allowing an average of 3*s.* per diem for his work, this additional saving was £2,000,000 a year. The moral results of railways were equally remarkable. It was observed that before railways existed, internal communication was restricted by physical circumstances. Railway communication was free from all these difficulties, and every obstacle that Nature had opposed, Science had hitherto effectually surmounted.

The address concluded with some words of practical application: the duty devolved on civil engineers of improving and perfecting this vast system. Every farthing saved on the train mileage of the kingdom, was £80,000 a-year gained to railway companies. There was therefore ample field for economical appliances, and therefore no economical arrangement, however trifling, was to be neglected. Nothing would afford the president greater satisfaction than that from his observations some sound practical improvement should result to a system with which his name, in consequence of his father's works, had been so largely associated; for however extensive his own connection with railways, all he had known, and all he had himself done, was due to the parent whose memory he cherished and revered.

Referring to the benefits derived from the Institution, the president observed, that it was the arena wherein had been exhibited that intelligence and familiar knowledge of abstract and practical science characterising the papers and discussions; in consequence of the constant intercourse within its walls, professional rivalry and competition were now conducted with feelings of mutual forbearance and conciliation, and the efforts of the members were all directed in the path of enterprise and towards the fair reward of successful skill. The business of the civil engineers from a craft, had become a profession, and by union and professional uprightness a great field was opened to energy and knowledge.

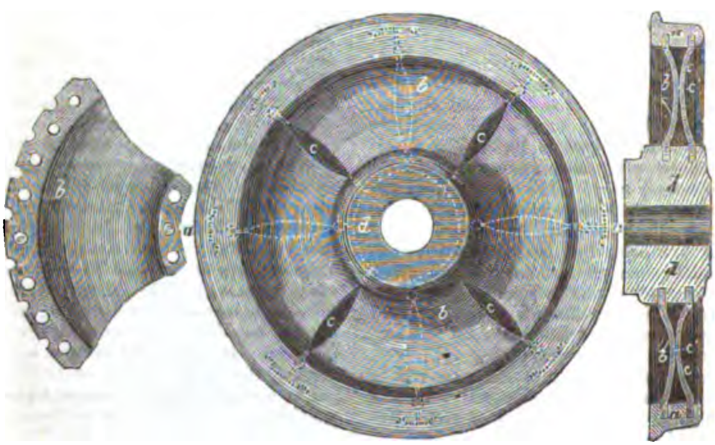
RYE'S IMPROVED RAILWAY WHEELS.

(Patent dated May 16, 1855.)

Mr. Wharton Rye, iron-founder, of Miles Platting, near Manchester, has recently introduced an improved railway wheel, which is formed of two or more wrought-iron plates, having a circular piece taken out of the centre of each, and their sides hollowed or dished out from their periphery towards the centre. Their convex surfaces are placed together, back to back, and the rim of the wheel and the boss or nave of the wheel are cast upon or around the wrought-iron plates, thus combining the whole together, the rim being "chilled" in the casting, and the nave merely requiring boring out and finishing.

Fig. 1 of the accompanying engravings represents a wrought-iron plate, being a segmental part of the entire set of such

Fig. 1. Fig. 2. Fig. 3.



plates, required to form the wheel represented, and showing holes or perforations punched or bored in the plate, through and round which the molten metal forms a permanent mass in the casting of the rim and nave of the wheel; fig. 2 exhibits a front

elevation of a railway waggon wheel constructed according to this invention, and in this instance eight segments of wrought-iron plates, similar to fig. 1, are employed; and fig. 3 represents a section taken through fig. 2. In the manufacture of the wheel the mould of the rim, *a*, is first properly formed in the sand, when it is necessary to arrange and place the eight wrought-iron plates, *b, b, b, b*, and *c, c, c, c*, four being upper and four lower plates, in such manner that they may "break joint" (as shown in dotted lines), their convex surfaces meeting in contact with each other, and their outer peripheries being disposed so as to allow of their entire encasement by the molten metal of the rim, *a*, when cast (this being effected as soon as the mould is properly secured), when the rim, *a*, may be allowed to cool. The wheel being so far advanced, it is now necessary to prepare a mould for the nave or boss, *d*. This is effected in the ordinary manner; but while in its progressive state, at the appropriate time, the rim, *a*, with the plates cast in it, is placed concentrically to the mould of the nave or boss, *d*, the inner peripheries of the plates extending within the diameter of the boss or nave, *d*, and a slight space being left between each of the plates to allow for contraction in the boss, so that in the casting of the boss or nave, *d*, (when the mould is completed) the molten metal may fill up the perforations of the plates at their inner peripheries, and bind or combine them with the nave or boss in one solid mass, in a similar manner to that described in the casting of the rim, *a*. The wheel is now completed with the exception of the boring out and finishing of the nave. *e, e, e*, exhibit the holes or perforations of the plates for the passage of the cast metal, as before mentioned.

BALAN'S AERIAL RAILWAY.

An invention to which the above designation has been given has recently been patented in this country by M. Alexander Balan, a young French enigneer. It consists in constructing and connecting two inclined ropes or cables in such manner that on the arrival of a wagon or load at the bottom of the second incline, and on it being unloaded, the arrival of a loaded wagon at the foot of the first incline shall raise up the unloaded wagon to the level from which it first started. The ropes or cables are stretched from one post to another, being fixed at one post at the same height, or nearly so, while at the other post they are fitted to a balance lever.

This lever is fitted to a post or upright in such manner that one end shall be above the level of the point at which the ropes are fitted to the opposite post or upright, while the other end is below its level. On a loaded wagon starting from the highest point, which will be from that part of the cable connected to the upper arm of the lever, by its own gravity it will descend the inclined plane until it reaches the lowest part of the incline at the opposite upright; it will then start again, and descend the lower inclined plane until it reaches the lower arm of the lever. Supposing it then to be unloaded, and a loaded wagon to arrive at the bottom of the first incline, by its superior gravity the loaded wagon will cause the two inclines to change places, and will thus raise the unloaded wagon to the highest point from which it first started.

For a continuous line in the same direction, as soon as a wagon has reached the bottom of an incline, it is raised to the top of the next inclined planes in succession, and so on. The accompanying engravings represent the manner in which the invention is

Fig. 1.

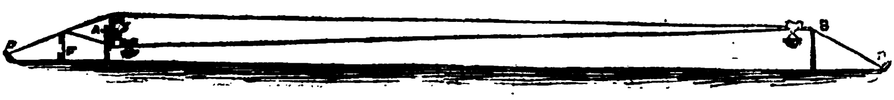


Fig. 2.

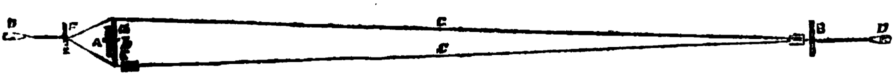
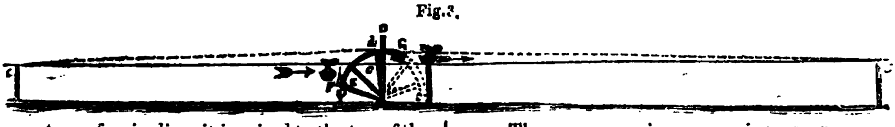


Fig. 3.



carried into effect. Fig. 1 is a side elevation of a single line of way with the ways inclined, and the wagons or loads at the bottom of their respective inclines. Fig. 2 is a plan. A and B are two uprights or posts sunk firmly in the ground. C C are two ropes or ways (which converge at the post, B, over the top of which they are passed and secured) fixed to the block, D. E is a lever centred at *b*, in the post, A. To the ends of this lever the diverging ends of the ropes or ways are securely attached, from which they again converge, and are passed over the upright, F, and fastened to the block, D. The lever, E, being centred at *b*, is capable of being reversed, so that the lower inclined plane can be raised to the position of the upper incline, and *vice versâ;* consequently, when the empty wagons arrive at the bottom of the lower incline, by shifting the position of the lever, the wagons are raised, together with their rope or way, to the position of the upper incline; when, upon being loaded and started off, they will, by their own gravity, proceed down the incline until they arrive at the bottom. Wagons may be employed on each rope or incline, so that while one set of wagons is traversing the upper incline in one direction, another set shall be passing along the lower incline in the reverse direction.

For earthworks, such as cuttings, embankments, quarries, &c., this invention will be found very advantageous; or in crossing rivers, canals, &c., where bridges would interfere with navigation. It has been used at Woolwich Arsenal for transporting heavy bodies, and given great satisfaction. The wagons may, if desired, be employed for transporting passengers or live stock as well as goods. When the distance to be travelled over becomes too long for a single length of rope or way, the inventor makes use of support placed at intervals, according to the undulations of the ground. It is, however, necessary that the intervening supports should be so arranged that upon a wagon arriving at the support, the rope or way should be raised so as to carry on the incline, and not interfere with the onward progress of the wagon. This is accomplished by the following arrangement:—Fig. 3 represents a side elevation of a double length of ropes or ways supported in the centre by a moveable support. This support consists of a vertical frame, D, figs. 4 and 5, to which is hinged near the ground line a moveable frame, E. This frame is maintained in a position near the ground by means of a trigger, F. It, therefore, follows that when the car or wagon arrives near the bottom of the incline, it touches the trigger, and thereby liberates the frame, E, which, being provided with counterbalance weights, G, is caused to swing over to the position shown by the dotted lines, thereby elevating the rope from

Fig. 4.

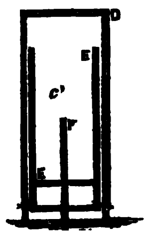
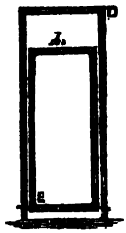


Fig. 5.



c to *d*, and thus forming a second incline, down which the wagon travels by its own gravity until it reaches the terminus at the bottom, or strikes a second trigger in connection with a second moveable support, when the wagon is again caused to travel forward. The frame, E, is restored to its first position by means of a pinion gearing into teeth upon the face of the frame, or by any other suitable means.

THE COMPASSES OF IRON SHIPS.

A long discussion, which was conducted during the past year by Professor Airy and Dr. Scoresby in the columns of the *Athenæum*, on the question of the variation of the compass in iron ships, has led to a practical result. Dr. Scoresby is going out to Australia, with an express view to perform experiments in the southern hemisphere. With great liberality, the directors of the Liverpool and Australian Navigation Company have granted the use of a state cabin in their splendid screw-steamer, the *Royal Charter:* a vessel well adapted for scientific experiments. The masts are of wood. The compasses are so arranged as to check each other. The wheels, we are told, are not likely to influence even delicate experiments. So far all is satisfactory. The *Royal Charter* sails next week for the antipodes. Dr. Scoresby has already commenced his labours; and the ready way in which he has hitherto found his wishes complied with by the Navigation Company permit us to hope that every means will be afforded during the voyage for collecting valuable observations. Dr. Scoresby, we must add, speaks in the warmest terms of the Company's kindness, and very sanguinely as to the anticipated success of his voyage.

VENTILATING BRICK-WORK FOR THE DWELLINGS OF THE POOR.

We have had submitted to us by Mr. F. Lloyd, of Snow-hill, London, a very excellent plan of arranging hollow bricks, designed especially to afford cheap, simple, and effectual ventilation, particularly in the humbler classes of dwellings. By the arrangement shown the air is conducted from the mantel to the upper part of the room, where it is delivered warm, the warmth being acquired chiefly from the smoke-flue, whereby an economy of heat, and consequently of fuel, is obtained. This arrangement, besides giving perfect ventilation, tends to prevent the annoyance of a smoky chimney, and to give uniformity of temperature to all parts of a room.

Another arrangement is also shown in which hollow bricks] form, at the back of the fire-place and smoke-flue, air-flues, which may be carried to any desired height, and to the right or left, in the same or other rooms. By this means part of the heat of the back of the smoke-flue, instead of being suffered to escape at the chimney-top, may be carried to any room, and be the means of giving warmth and ventilation to rooms not provided with a fire-place. In cases where a large supply of fresh air is required, as in barracks, lodging-houses, &c., the four sides of the smoke-flue are to be carried up with the hollow bricks. Hollow mantel-pieces are in course of manufacture, in pottery, which will be cheap, of a neat appearance, and occupy less space than brick-work. In first-class houses a hollow box-mantel of marble could be used as the air-conduit, instead of the brick and wood mantel described above as a cheap means. The air-vents at the ceiling could be easily masked by an open ornamental cornice.

The plan above described may be seen in operation at Mr. Looker's Brick Works, Kingston-on-Thames, and those interested in sanitary improvements are especially invited to see it. A model may be seen at the Architectural Exhibition now open in Suffolk-street, Pall-mall-east, and is well worthy of the attention of Mr. Twining and his fellow-promoters of the Special Museums for the Working Classes.

SIEMEN'S IMPROVED AIR-PUMP.

In this instrument, as the ingenious patentee informs us, "an essentially new feature, if not, indeed, virtually a new principle also, has been introduced into the construction of this important machine. The new air-pump consists of two cylinders, differing in magnitude, of which the smaller is applied either to the bottom or top of the larger, while the valved pistons belonging to each respectively are attached to the same piston rod. The air withdrawn from the receiver, or other vessel intended to be exhausted, is condensed in the lower cylinder into one-fourth of its original volume, and consequently always possesses sufficient elasticity to pass through the discharging valve and escape into the atmosphere, the opposing pressure of which on that valve is thus counteracted in a perfectly novel manner."

We regret that want of space prevents our giving illustrations showing the construction of this valuable instrument.

The new air-pump (manufactured by Messrs. Knight) is cheaper than those of the ordinary construction, especially when its perfection is taken into consideration, and, *ceteris paribus*, if a well-made pump, of any of the ordinary constructions, will rarify the air to 99-100, the new one would carry the rarefaction up to 999,999-1,000,000, if a certain valve could be rendered automatic; but as it is, it will produce a vacuum approaching to the perfection assigned, in proportion to the smallness of the force required to open the said valve. Those who may require a powerful and perfect air-pump will do well to inspect this machine, the capabilities of which were exhibited to us by Mr. George Knight.—*Chemist.*

The Practical Engineer's Pocket Guide; A Concise Treatise on the Nature and Application of Mechanical Forces, the Centre of Gravity, the Elements of Machinery, &c.; with a Variety of Rules, and Valuable Tables of the greatest use to Engineers and Mechanics in general. By Professor Wallace. Glasgow: W. R. M'Phun. 1855.

The Practical Mechanic's Pocket Guide; or, a Concise Treatise on the Prime Movers of Machinery, and the Weight and Strength of Materials, with numerous Practical Rules and Tables. By Professor Wallace. Glasgow: W. R. M'Phun.

The Universal Calculator's Pocket Guide; a Companion to Every Set of Mathematical Tables, showing their Construction and Application to Arithmetic, Mensuration, Trigonometry, Surveying, Navigation, Astronomy, &c., &c. By Professor Wallace. Glasgow: W. R. M'Phun.

The Practical Mathematician's Pocket Guide; a Set of Tables of Logarithms of Numbers, and of Logarithmic Sines and Tangents; with other useful Tables for Engineers, Surveyors, Mechanics, &c. By Professor Wallace. Glasgow: W. R. M'Phun.

The Practical Chemist's Pocket Guide; being an Easy Introduction to the Study of Chemistry. By WILLIAM HOPE, M.D., Operative Chemist. Glasgow: W. R. M'Phun.

ALTHOUGH these admirable shilling volumes, published by Mr. M'Phun, of Glasgow, have been well-known and highly-appreciated for years among practical men, the issue of new editions of several of them may very well be attended by a notice of them in our pages. Mr. M'Phun was among the earliest of the publishers who brought scientific knowledge before our practical men in a cheap and appropriate form; and his little treatises contrast favourably, even now, after the influx of cheap literature which we have experienced, with many works of much higher pretensions.

As the titles of the volumes given above are, to a great extent, explanatory of their contents, we shall not here analyse the substance of these works, but simply say, that they have been written throughout with singular skill and accuracy, and that they well deserve the confidence of practical men.

CAPTAIN NORTON'S CARTRIDGES.

To the Editor of the Mechanics' Magazine.

SIR,—It is now three months since I explained, and practically proved, by "invitation," to the select committee of artillery officers at Enfield, the nature and construction of my patented cartridge for small arms, particularly its fitness for breech-loading arms. I have not received a report of the opinion of the committee on it. *Three* months, one would suppose, was ample time for them to make up their minds. I have lately submitted this cartridge for the consideration of the French ordnance, under the auspices of *one* who knows what a cartridge ought to be, and do not expect that they will be long in forming their judgment on it. One modification of the cartridge is to substitute gun-cotton for gunpowder. The gun-cotton *alone* would be uncertain in its perfect ignition, sometimes slow, at other times quick; but the insertion of a little fulminating mercury in the bottom of the cartridge, ensures at all times the perfect ignition of the gun-cotton; for the fire of the percussion-cap explodes the fulminating mercury within the cartridge without *piercing* the paper of it, for the reason that 350 degrees of heat will explode fulminating mercury, whereas it requires about 700 degrees to fire gunpowder. This cartridge may be left in a gun for many months without soiling the interior of the barrel, and can then be drawn without detriment to its efficiency. The soft and flexible nature of gun-cotton will not cause the paper of the cartridge to *fret* by carriage, as the grit-like nature of the grains of gunpowder does. When the shot is an elongated one for a rifle, the cartridge can be attached to its base instead of covering it. I have fired a great number of these latter from an ordinary dragoon's pistol with the military percussion-cap, and find that they never miss fire, nor is the barrel of the pistol soiled so as to impede in the slightest degree rapidity of loading after many discharges; neither is there any residue of the paper left behind in the barrel. Any person taking an interest in the efficiency of our arms at the present crisis, may satisfy himself by making such cartridges and testing them.

I am, Sir, yours, &c.

J. NORTON.

Rosherville Hotel, Gravesend,
Dec. 6, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BAKEWELL, F. C. *Improvements in rotating breech fire-arms.* (A communication.) Patent dated June 13, 1855. (No. 1346.)

This invention consists primarily in adding to the fore part of the rotating chambered breech a short tubular extension terminating in a collar, which collar fits into a corresponding recess in the bracket of the barrel. This improvement is intended to serve the twofold purpose of preventing the spindle on which the breech rotates from fouling, and of connecting and locking the breech.

AVERY, J. *Improvements in oscillating steam engines.* (A communication.) Patent dated June 13, 1855. (No. 1347.)

This invention primarily consists in cutting off the steam at any desired point in the stroke of the piston, by means of ring valves fitted in the ends of the cylinders, and furnished with protruding stems which are to be acted upon, for the purpose of moving or starting the valve, by arms or bars occupying an inclined position outside the cylinder, or by valves applied between the main induction and eduction valve and the cylinder, in such a way that when balanced by the admission of steam behind them, they will be closed by the current of steam following the piston, and opened by the back pressure before the piston.

TURNER, E. R., and F. TURNER. *Improvements in machinery or apparatus for crushing and grinding grain, seeds, and pulse.* Patent dated June 13, 1855. (No. 1349.)

In this invention the grain or pulse is distributed by means of a feed roller between the crushing or bruising rollers, and after being there crushed it descends through the eye of the top stone on to the runner, where

it is ground in the usual manner, and is discharged through a spout or opening fitted on to or made in one piece with the case containing the stones.

MOXON, W., and J. CLAYTON. *Certain improvements in looms for weaving carpets and other looped fabrics.* Patent dated June 13, 1855. (No. 1350.)

This invention mainly consists in the use of a drum or pulley in connection with the wires for the purpose of withdrawing and replacing or throwing out such wires as are employed in the weaving of carpets or looped fabrics.

BETTELEY, J. *An improvement in the manufacture of iron knees for ship-building.* Patent dated June 13, 1855. (No. 1352.)

This invention consists "in rolling or forming iron for iron knees tapering or wedge shape, having projecting ribs intermediate of the widths of such iron, or at the edges thereof, and also forming solid projections at intervals."

BETTELEY, J. *An improvement in ships' anchors.* Patent dated June 13, 1855. (No. 1353.)

In this invention the shank is made of two plates or bars of iron which are kept at a distance (by wood or otherwise) from each other, and by preference hooped together.

COTTAM, G. *Improvements in hay-racks and harness-brackets.* Patent dated June 13, 1855. (No. 1354.)

In constructing a hay-rack according to this invention there is applied at the lower part a moveable seed box into which the seed descends and is preserved. In the construction of a harness-bracket the part on which the saddle is placed is made moveable on a hinge or axis at the back; and the hook which receives the bridle and other parts of the harness acts as a prop or support for the moveable part of the bracket.

BIDDELL, G. A. *Improvements in the manufacture of machines for cutting or grinding vegetable and other substances.* Patent dated June 13, 1855. (No. 1355.)

In this invention pieces of steel of the desired form and substance required for the cutting or grinding parts are placed in moulds and the melted iron is poured into them, so that the pieces of steel become firmly held by the cast iron.

HOLLIS, E. *A new or improved method of securing ramrods to fire-arms.* Patent dated June 14, 1855. (No. 1358.)

This invention consists in the use of a spring and roller situated on the stock of a musket or other fire-arm for the purpose of retaining the ramrod in its place in the stock while permitting its ready introduction and removal.

ENOUY, J. *The means of "removal" of every rotary or "revolving barrel or cylinder" containing chambers from all revolver pistols, guns, and fire arms, and the "substitution" in their place by another and other "barrels or cylinders" in succession.* Patent dated June 14, 1855. (No. 1359.)

This invention appears to consist mainly in "the arrangement of any given number of revolving barrels or cylinders containing chambers from number one upwards unlimited; affixed to or within and on a framework, which by a movement or partial rotation brings each and every barrel successively towards the lock of a fire-arm."

LELOUP, F. *Certain improvements in treating textile fabrics or substances for separating cotton or other vegetable substances from wool, silk, and other animal products.* (A communication.) Patent dated June 14, 1855. (No. 1361.)

Claim.—The separating of cotton or other vegetable substances from wool, silk, and other animal products, by submitting the same to an acid bath kept just below, or not allowed to exceed, boiling point, as described. Also, subjecting the animal fibres resulting from the acid bath to a further described treatment to render them fit to be again used in the manufacture of tissues or fabrics.

LISTER, S. C. *Improvements in treating silk waste, also the noils of silk, wool, and goats' wool or hair, before being spun.* Patent dated June 14, 1855. (No. 1362.)

This invention consists.—1. In carding or otherwise setting the fibres straight, and in then combing or hackling them in self-acting machines. 2. In recombing the noils, backings, and milkings made in combing silk noils. For this purpose a machine adapted for combing short fibre will answer. 3. In mixing the noils of silk, after being combed, with combed noils of wool hair, or with cotton; also in mixing the combed noils of wool or hair with cotton.

CHANCE, J. T. *Improvements in glass-flattening furnaces.* (A communication.) Patent dated June 14, 1855. (No. 1363.)

In the improved furnaces, the flame is made to pass from the fire grate over an arch or other covering before entering the flattening chamber or coming over the flattening bed, so that the greater part of the dust is deposited on such arch or other covering.

HEWITT, W. *Improvements in propelling vessels.* Patent dated June 15, 1855. (No. 1364.)

This invention consists in feathering or setting at any required angle the blades or floats of propellers by means of quadrants placed upon them, and actuated by a pinion.

CLAY, W. *An improved manufacture of bar iron.* Patent dated June 15, 1855. (No. 1365.)

This invention consists in "manufacturing bar-iron of a hollow or concave or a convex section, or angle iron, T-iron, double T-iron, and single or double grooved or channel bar iron, in a taper form; that is, gradually increasing or decreasing the sectional area of the bar from one point of the length to another."

CLAY, W. *The application of certain descriptions of bar iron to purposes where great strength or stiffness is required.* Patent dated June 15, 1855. (No. 1366.)

This invention consists in applying the tapered iron described in the previous abstract to structures in which great strength or stiffness is required.

BRIDGEWATER, H. *An improved construction of spike for railway and other purposes.* Patent dated June 15, 1855. (No. 1367.)

The inventor forms a spike with a solid head and a hollow split expanding shank.

MATHIS, H. *Improvements in preserving wood.* (A communication.) Patent dated June 15, 1855. (No. 1369.)

In carrying out this invention soon after a tree is felled, a saw cut is made all round the trunk, and caulked or stopped in any convenient manner, and into the space thus formed a solution of sulphate of copper is conducted by a tube from an elevated reservoir.

SADLER, J. H. *Improvements in looms for weaving.* Patent dated June 15, 1855. (No. 1370.)

This invention consists in an arrangement of the driving parts of power looms by which the treading motions are accomplished and arrested for a time whilst the shuttle passes through the shed. For this purpose a pinion is fixed on the crank axis, having teeth on a portion only of its circumference. The teeth of the pinion take into and drive a wheel having teeth at one or more intervals only, and not all around its circumference, so that the wheel will receive a partial revolution from the pinion which is on the crank axis, and then remain stationary until, by the revolution of the crank axis, the teeth of the pinion act again on the teeth of the wheel. It consists also in a mode of giving motion to the pickers.

MORRELL, G. F. *An improvement in ink-bottles or ink-vessels.* Patent dated June 15, 1855. (No. 1371.)

In the improved ink-bottle, the upper portion where the neck is usually formed is made flush, or only slightly projects, and a tubular opening or passage is formed which descends into the vessel and is open at the lower end.

PALLIER, D. *Improvements in the manufacture of soap or saponaceous substances.* Patent dated June 16, 1855. (No. 1372.)

Claim.—The use of a mixture of milk, water, and flour or farina, when used for the purposes of manufacturing or making soap or saponified matters of any description.

JONES, W. *Improvements in machinery for punching and shearing plates of metal, which improvements are also applicable to stamping and pressing metals and other substances.* Patent dated June 16, 1855. (No. 1373.)

This invention consists in the application of a continuous spiral or lappet roller, acting progressively on a number of punches or dies in the same machine.

WEBSTER, J. *A new or improved balance.* Patent dated June 16, 1855. (No. 1374.)

The inventor uses a spring to counterbalance the article weighed, and a dial and pointer to indicate the weight of it.

SELLARS, J. *Improvements in the manufacture of starch, and in the use of substances employed therein.* Patent dated June 18, 1855. (No. 1377.)

This invention consists in "the use of barley or rye, either alone or in combination with wheat or other substances, for the manufacture of starch, either in the crystal or powdered form, or in the damp or moist state."

CARLHIAN, I., and I. CORBIERE. *Improvements in moderator lamps.* Patent dated June 18, 1855. (No. 1378.)

This invention consists in preventing air from entering the lower end of the supply tube by keeping it charged with oil; in certain modes of fixing the burner to the body of lamps in which the supply tube is not in the centre; and in a novel mode of constructing the rack guide and pinion-holder.

REAL, L. H. *Certain improvements in elastic bottoms or seatings for beds, mattresses, and seats.* Patent dated June 18, 1855. (No. 1379.)

This invention mainly consists in connecting the ends of transverse lathes to the frames of beds, mattresses, &c., by means of springs; in connecting the middle points of a series of such lathes to a fixed longitudinal support, so that the motion of a person lying on one side of such support shall not affect a person lying on the other side of it; and in constructing a certain expanding lath.

PEAKER, R., and T. BENTLEY. *Improvements applicable to machinery for grinding wheat and other grain, cement, and other substances.* Patent dated June 18, 1855. (No. 1380.)

This invention consists—1. In the use of a perforated division plate extending across the casing of the machine. 2. In the employment of an agitator, brush, or equivalent

apparatus for removing the material from perforated surfaces used for such purposes as the division plate. 3. In the employment of rotatory or other perforated surfaces acting within the exhaust pipe. 4. A method of cutting stones.

BESSEMER, H. *Improvements in screw propellers, and in the shafts and cranks by which they are driven, which improvements are also applicable generally to the shafts and cranks of marine, stationary, and locomotive steam engines.* Patent dated June 18, 1855. (No. 1382.)

This invention consists in casting or founding the articles named in the title in molten steel, or in a mixture of steel and pig or refined iron.

LITTLE, W. *Improvements in printing machinery.* Patent dated June 18, 1855. (No. 1383.)

Claim.—The application of bent electrotype, and compound electrotype and stereotype plates, in cylinder printing machines.

BESSEMER, H. *Improvements in the manufacture of cast-steel, and mixtures of steel and cast-iron.* Patent dated June 18, 1855. (No. 1384.)

Claims. 1. The conversion of iron into steel in retorts, tubes, or chambers placed in a vertical position, or as nearly so as will allow the iron or steel under operation to descend through them by the force of gravity, and thus allow the process of cementation to go on continuously. 2. Melting in close pots or vessels, (either alone or mixed with steel that has been otherwise manufactured) steel made by puddling pig or refined iron until so much carbon only is left in combination with it as to constitute steel. 3. An arrangement of separate compartments or pot chambers in a furnace for founding steel or mixtures of steel and cast iron, and a mode of conveying the molten metal to the mould as described. 4. The discharge of fluid steel, or a mixture of steel and cast iron, from a hole in the lower part of the pot or vessel in which it is melted, and the closing of such hole by a plug or valve of fire-clay, or a stopping of loam or lute of any suitable kind. 5. Mounting the cover of the furnace on wheels, and the use of an excentric feeding hole as described. 6. Melting steel or mixtures of steel and cast iron in retorts as described.

BLANCHARD, T. *A new and improved method of bending timber.* Patent dated June 18, 1855. (No. 1385.)

Claims.—1. Subjecting the timber to pressure upon all sides during the operation of bending. 2. A described machine for the purpose of bending timber, consisting essentially of the following elements, or their equivalents, in combination. First, a bending lever; secondly, a device for compressing the timber while it is being bent; thirdly, a curved mould in which the pressure is continued, and in which the timber is removed from the machine after the bending operation is completed; fourthly, an arrangement for transferring the timber, during the operation of bending, from the straight box in which it is first compressed to the curved mould in which it is removed from the machine.

BESSEMER, H. *Improvements in the manufacture of ordnance.* Patent dated June 18, 1855. (No. 1386.)

Claims.—1. The founding or casting of ordnance in molten steel, such pieces of ordnance having formed thereon trunnion handles, or other necessary projecting parts, so as to give the general shape and configuration to the piece of ordnance by the process of founding. 2. Founding ordnance in molten steel in loam or sand moulds as described. 3. The partial decarbonization of steel ordnance as described.

BESSEMER, H. *Improvements in the manufacture of rolls or cylinders used in the lamination, shaping, and cutting of metals, in crushing ores and other substances, and in calendering, glazing, embossing, printing, and pressing.* Patent dated June 18, 1855. (No. 1388.)

Claims.—1. The casting or founding of rolls or cylinders in molten steel. 2. The casting or founding of rolls or cylinders with a mixture of molten steel and pig or refined iron.

BESSEMER, H. *Improvements in the manufacture of railway wheels.* Patent dated June 18, 1855. (No. 1390.)

Claims.—1. The casting or founding of railway wheels in molten steel. 2. The founding or casting of railway wheels in a mixture of steel and pig or refined iron.

JONES, J. *Improvements in obtaining motive power.* Patent dated June 18, 1855. (No. 1392.)

In this invention water or other fluid is raised by steam power, and allowed to fall from an upper tank on to an endless chain of buckets carried by a suitable carrier drum or wheel.

JOHNSON, J. H. *Improvements in furnaces or fire-places.* (A communication.) Patent dated June 18, 1855. (No. 1393.)

In order to avoid the formation of carbonic oxide, the inventor forms a furnace of a parabolic form, and forces into it air under great pressure.

HARTMANN, C. A. *Certain improvements in the preparation or combination of colours for printing stuffs and textile fabrics.* Patent dated June 19, 1855. (No. 1394.)

This invention consists—1. "In the preparation of a steam madder red by the mixture of extract of madder with soap or the

materials of soap, or with solution of ammonia and soap or the materials of soap. 2. In the preparation of a steam madder puce by the addition to such steam madder red of variable quantities of extract of campeachy wood, or of the extracts of campeachy wood and catechu. 3. In the preparation of a steam indigo blue by the mixture of precipitated indigo with magnesia. 4. In the preparation of a steam green by mixing a salt of lead with the aforesaid steam indigo blue, and dyeing or raising the colour in a solution of bichromate of potash. 5. In the preparation of steam colours by the addition generally of other colouring matters, and particularly of extracts of dye woods, to the extract of madder and soap or the materials of soap, so as to obtain in steam colours the effects of mixed dyes.

Burke, F. *Improvements in preparing pulp or pulpous material, applicable in the manufacture of paper, and for other useful purposes.* Patent dated June 19, 1855. (No. 1397.)

The object of this invention is to convert the fibres of vegetables into pulp without having recourse to the previous process of separating the fibrous matter from the other component parts of vegetable substances, and for this purpose means are adopted for simultaneously, or in one process, reducing the fibres to a state of pulp, and separating the pulp from the gummy and other vegetable matters.

Macintosh, J. *Improvements in fuses, fusees, and matches.* Patent dated June 19, 1855. (No. 1398.)

This invention consists—1. In forming a paper fusee. 2. In forming a fusee by spreading phosphorous paste on strips of cardboard, and then varnishing them. 3. In inserting a piece of wire into the interior of the fuse, in order to decrease the liability of the ignited end to fall off.

Gover, D. *Improvements in the construction of gun-carriages, and appliances connected therewith.* Patent dated June 19, 1855. (No. 1399.)

Claims.—1. Mounting the guns of field pieces upon a traversing platform, whereby the gun may be turned round in either direction, so as to facilitate its loading or charging. 2. The application to the carriages of field pieces of inclined shields for the purpose of protecting the men who work the piece.

Letchford, J. *An improved construction of folding bedstead.* Patent dated June 19, 1855. (No. 1400.)

The sacking frame of the improved bedstead folds down upon the central frame and encloses it between them, and is so arranged as to give steadiness to the bedstead when open. The central supporting frame is provided at its upper parts with stops, which prevent the bed from swaying in the direction of its length, &c.

Johnson, J. H. *Improvements in machinery or apparatus for emptying cesspools and privies.* (A communication.) Patent dated June 19, 1855. (No. 1401.)

This invention mainly consists in the employment of a wrought iron or other suitable air-tight vessel, mounted on wheels, and capable of being transported to any desired locality. This vessel is connected with one or more air pumps, which are worked by the motion of the running wheels.

Johnson, J. H. *Improvements in the storing and treatment of grain.* (A communication.) Patent dated June 19, 1855. (No. 1402.)

This invention mainly consists of an arrangement of perforated granary floors placed one above another, the perforations in such floors being so arranged, that the grain is allowed to fall from the top floors through all the lower ones at a gradually increasing speed as it descends. In the centre is a well or shaft in which works an elevator or chain of buckets for raising the grain.

Holmes, W. C. *Improvements in the manufacture of gas, and in apparatus employed therein.* Patent dated June 20, 1855. (No. 1405.)

This invention consists—1. In the introduction into a retort or carbonising vessel of a flue or draft tube, made separately from the retort, and in the insertion of shelves or diaphragms, either horizontal or vertical, made to fit loosely in the interior. 2. In a method of combining the air condenser, wash vessel, coke vessel or scrubber, and purifier in one vessel or case, and a method of changing the lime or other purifying agent in one part of the purifier of the combined apparatus whilst the other is working. 3. In an arrangement of self-acting valves for dispensing with the present hydraulic main. 4. In the distilling of coal, peat, oil, resin, and other gas-producing substances by means of superheated steam for the purposes of illumination.

Walker, R., and A. M'Kenzie. *Improvements in electric telegraphs.* Patent dated June 20, 1855. (No. 1410.)

This invention consists of apparatus to be used when single currents of electricity are employed in one line wire. This apparatus is so arranged that by the simple touch of a key at the distant station the signs that indicate each letter of the alphabet shall be made. For this purpose a key-board is made with a number of keys, each key representing a letter. On a cylinder or other suitable form opposite each key are fixed pieces of metal of such length and arranged

in such order that, on being used for the time being for making up a circuit, they will indicate the letter represented by the key, and the requisite use in succession of these pieces of metal may be obtained either by the simple movement of the keys, or the joint movement of the keys and the cylinder or surface on which the pieces of metal are fixed. It also consists in combining two ends of a line wire by means of springs.

SAVAGE, R. W. *Improvements in single and double-action swing doors.* Patent dated June 20, 1855. (No. 1412.)

"Close to the edge of the door, nearest its turning point, and secured underneath the same, so as to allow the door to travel on it," the inventor places an inclined plane or wedge piece.

LANE, U. *An improvement in the manufacture of pumps.* Patent dated June 20, 1855. (No. 1413.)

Claim.—The manufacture of pumps by an arrangement of tubes without any other packing between them than that supplied by the water or other liquid to be raised by the pump.

COCHAUD, E. *Improved apparatus to be used in making aërated or gaseous liquids.* Patent dated June 20, 1855. (No. 1414.)

The inventor describes and claims "a plain or double apparatus, intended for generating gas and dissolving it in water, either separately or externally as in the former apparatus, or at the same time it is generated as occurs in the double apparatus."

POL, L. *Certain improvements in piano-fortes.* Patent dated June 20, 1855. (No. 1415.).

This invention consists—1. In the use of a board having as many set screws as there are strings in the piano, so that the player may tune his own instrument. 2. In the use of a sounding-board constructed with split wood, independent both of the peg-bar and the bar for the points.

NEWTON, W. E. *Improved machinery for polishing or finishing thread.* (A communication.) Patent dated June 20, 1855. (No. 1416.)

Claims.—1. "Mounting the hanks separately on rollers, so that each hank or bundle of hanks may be kept at the proper tension without reference to the other hanks in the machine. 2. Placing the polishing bars diagonally on the cylinders."

FABIEN, J. F. V. *Improved machinery for manufacturing wheels.* (A communication.) Patent dated June 20, 1855. (No. 1417.)

Claim.—The combination of pressing rollers rotating round a common centre with a die borne upwards or towards such rollers by means of hydraulic or other suitable pressure.

JULLION, J. L. *The manufacture of paper, card, and millboard from certain vegetable productions.* Patent dated June 21, 1855. (No. 1418.)

Claims.—1. The manufacture of white paper and card from the fibres of the plantain and banana plants, sugar cane, and reeds, by certain described processes. 2. The employment of alkaline sulphurets, or a mixture of alkaline and earthy sulphurets with hydrates of alkalis in the manufacture of paper from straw. 3. The application of percolation under high pressure, combined with an alternating tumbling motion, in boiling all substances intended for the manufacture of paper, card, and millboard. 4. The employment of a rotatory vessel in which a pressure of chloride gas is generated for the purpose of pickling or bleaching materials used in the manufacture of paper. 5. The employment of a current of atmospheric air, either warm or cold, in the process of bleaching, as described.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BARRINGTON, W., and W. R. LE FANU. *An improved mode of joining "bridge-rails" in the permanent way of railways by means of a fish-piece.* Application dated June 11, 1855. (No. 1331.)

In this invention the piece of iron or "fish" is placed in the hollow part of the rail, and one end of it is riveted or otherwise secured to one length of rail, and the other end bolted to the other, the bolts running horizontally through the fish and the rail on each side of it.

BARDO, F. T. S. *An improvement in cases for carrying tickets, cards, and other like articles.* Application dated June 11, 1855. (No. 1332.)

This invention consists in constructing pocket-cases with a transparent back, front, or side, which shall not be liable to break or crack by the ordinary wear of pocket-cases.

JOHNSON, J. H. *Improvements in metallic pens.* (A communication.) Application dated June 11, 1855. (No. 1333.)

These improvements consist in forming a cheek on each side of the nib by bending over the sides to a vertical or nearly vertical position, thereby imparting a trough-like shape to the underside of the pen, which thus serves as a reservoir.

COULSON, S. *An improvement in the preparation of sulphate of baryta, and in the manufacture of glass when sulphate of baryta is used.* Application dated June 12, 1855. (No. 1339.)

This invention has for its object the reduction of sulphate of baryta by heat into

the state of powder or very small crystals, in place of reducing the sulphate by simple grinding as heretofore; and, secondly, the application of the sulphate so reduced to the manufacture of glass.

Metcalfe, T. *An improved mode of manufacturing collapsible hats and bonnets.* Application dated June 12, 1855. (No. 1341.)

This invention relates to the manufacture of collapsible hats and bonnets from straw, grass, or other similar plait.

Blackman, W. J. *A new medicine or syrup for the cure of coughs.* Application dated June 13, 1855. (No. 1348.)

This new medicine consists of a preparation of thyme, sugar-candy, and beer (with or without other ingredients,) which are mixed together and evaporated slowly by simmering till reduced to about one-half the original quantity.

Henson, H. H. *Improvements in the construction of portable and other buildings, and in the means of ventilating buildings.* Application dated June 13, 1855. (No. 1351.)

This invention consists in constructing huts for troops, lodges to parks, and agricultural buildings, &c., as follows. "I construct the beams and uprights," says the inventor, "of *wrought* or *cast*-iron, or of slate or of wood rendered fire-proof by any of the processes ordinarily followed for such purpose, and I groove and channel them in the parts required for the reception of panels of slate both for the roof, and side, and end walls, or the roofs may be composed of slate and the walls of slabs of plate or cast-iron or corrugated metal let into the grooves between the beams aforesaid. Or the walls may be composed of double panels one of wood and the other of slate, or of any of the other materials herein-mentioned for panels. Instead of slate, terra-cotta or common earthenware or artificial stone slabs may be employed."

Lodge, E., and G. Marshall. *Certain improvements in the production of animal and vegetable naphtha, ammonia, and charcoal, and also for the evolution of the carburetted and olefiant gases therefrom.* Application dated June 13, 1855. (No. 1356.)

This invention consists in employing the refuse or waste of wool and cotton for the production of the articles named in the title.

Sinclair, G. *Improvements in signalling between the engine-drivers and the guards of railway trains.* Application dated June 14, 1855. (No. 1357.)

These improvements consist mainly in so arranging metal bars horizontally under the carriages of a railway train, that the same can be connected and employed for actuating a lever, or other means of striking an alarum.

Robertson, A. *A new manufacture of packages for dry or moist goods or liquids.* Application dated June 14, 1855. (No. 1360.)

This invention consists of a canister or package of iron, or tinned iron, or zinc plate, secured at both ends by rimmed lids of the same metals.

Lee, W. *Improvements in water-closets.* Application dated June 15, 1855. (No. 1368.)

The principal feature of the improvements consists in employing as a service-box a suitably shaped reservoir, subdivided into three compartments or chambers by suitable partitions, &c.

Vaudelin, L. F. *Improvements in railway breaks or brakes.* Application dated June 16, 1855. (No. 1375.)

In this invention the brakes are of the usual shape, but have rigidly attached to them square bars of iron which are fixed horizontally and supported by suitable bearings; these bars are made to move in a horizontal direction by means of a shaft having a right handed screw cut on one end and a left handed screw on the other.

Wilding, W. H. *Improvements in furnaces.* Application dated June 18, 1855. (No. 1381.)

This invention consists in forming fire bars of fire stone (Kentish rag) or of fire clay or other composition of earthenware which will not fuse, and which will in other respects support the great heat and wear to which fire bars are subjected.

Francis, H. *Improvements in cutting out parts of garments or articles of dress.* Application dated June 18, 1855. (No. 1387.)

This invention has for its object improvements by which a number of pieces of fabric may be held and cut through. For this purpose presses or templates having the outlines of the pieces of fabric to be cut are made with true and upright edges which guide the cutting tool.

Myers, E. *Improvements in machinery or apparatus for raising water or other liquids.* Application dated June 18, 1855. (No. 1389.)

This machinery consists of a rotatory pump or engine in which is employed a pair of toothed or fluted drums gearing into each other, and rotated inside a suitable chamber formed in the suction-pipe.

Myers, E. *Improvements in buffers, draw-springs, and bearing-springs.* Application dated June 18, 1855. (No. 1391.)

The elastic medium is in this invention obtained by the application of atmospheric air confined in a cylinder, in which works an air-tight piston, the rod of which is fitted with a buffer head, or is connected to

the draw-bar, or attached to the body of the carriage, as the case may be.

NORTON, J. F. *Improvements in machinery or apparatus for measuring liquids and fluids, which is also applicable for obtaining motive power.* (A communication.) Application dated June 19, 1855. (No. 1395.)

In the improved machinery is a cylinder furnished with a supply pipe, and delivery pipe, and having in it a shaft to which is made fast a block or frame, the outer extremities forming the centres of flaps or valves, so arranged as to touch the interior of the cylinder near the supply pipe, and to be free from it near the delivery pipe; the water on entering acts upon the flaps and shafts, giving to them a certain motion.

DIXON, E., and T. BAILEY. *A new or improved tap or cock.* Application dated June 19, 1855. (No. 1396.)

In this invention a valve fitting into a seat is employed, and the thumb plate by which the valve is raised is provided with a washer which, when the thumb plate is raised, prevents any leakage which might otherwise occur between the valve stem and the roller in which it slides.

JOHNSON, J. H. *Improvements in the manufacture of dish-covers, dishes, plates, and other articles of sheet metal, and in the machinery or apparatus employed therein.* (A communication.) Application dated June 19, 1855. (No. 1403.)

These improvements consist in covering articles of the description named in the title which are composed of sheet iron with copper, German silver, nickel, or other suitable metal, which may then be plated or gilt in the ordinary manner.

HERTS, D. B. *An improved life-preserving harness.* (A communication.) Application dated June 20, 1855. (No. 1404.)

The object of this invention is to enable a person within a carriage, by merely pulling a cord to instantly strip the horse of the whole of his harness except the collar, bridle, and driving reins.

LONGRIDGE, R. B. *Improvements in the construction of steam-boilers and malleable iron tubes.* Application dated June 20, 1855. (No. 1406.)

This invention consists—1. In making cylindrical boilers or tubes or flanged rings without any joint or seam, such rings being connected by rivets or bolts through the flanges. 2. Making such rings corrugated for the internal flues of steam-boilers.

GREEN, J. *Improvements in oil lamps generally termed moderators.* Application dated June 20, 1855. (No. 1407.)

These improvements mainly consist in the construction of moderator lamps in such manner that they can be taken to pieces, and each piece be cleaned or repaired without the necessity of unsoldering the oil reservoir.

PROVISIONAL PROTECTIONS.

Dated August 29, 1855.

1951. Charles Pope Rosson, of Manchester, Lancaster, brush manufacturer. Certain improvements in machinery or apparatus employed for dressing and finishing textile fabrics, by the application of a new material, in the place of hogs' bristles or wire-cards hitherto employed therein.

Dated October 2, 1855.

2197. William Horton, of Birmingham, Warwick, operative gun-maker. Improvements in the breech part of fire-arms.

Dated December 5, 1855.

2739. William Henry Smith, of Wellington-chambers, Cannon-street West, London, merchant. An improved construction of fastening, applicable to gaiters, stays, and other like articles.

Dated December 6, 1855.

2741. Jonas Marland, of Sun Vale Iron-works, Walsden, Lancaster, and Samuel Marland, of Sun Vale Iron-works, Walsden, Lancaster. Certain improvements in power-looms.

2743. William George Wilson, of Penton-cottage, Penton-place, Newington Butts, zinc and tin-plate worker. A pneumatic moderator.

2745. Arthur Paget, of Loughborough, Leicester, manufacturer. Improvements in machinery or apparatus for the manufacture of looped or other fabrics.

2749. James Rock, junior, of Hastings, Sussex, carriage-builder. Improvements in the construction of tents, huts, and portable buildings.

2751. Thomas Chaffer, of Liverpool, Lancaster, stone merchant, and Jonah Ellis, of the Vulcan Foundry, near Warrington, engineer. Improvements in machinery for sawing and cutting slate, stone, coal, salt rock, or other minerals.

2753. Rudolph Bodmer, of Thavies-inn, London. An improved planimeter. A communication from Jacob Amsler, professor of mathematics, of Schaffausen, Switzerland.

2755. Angier March Perkins, of Francis-street, Gray's-inn-road. Improvements in apparatus for generating steam.

2757. Angier March Perkins, of Francis-street, Gray's-inn-road. Improvements in warming buildings and apartments by hot water.

Dated December 7, 1855.

2759. Antoine Latta, merchant, of Metz, France. Preparing gutta percha in combination with other substances, applicable to various purposes.

2761. David Dick, engineer, of Paisley, Scotland. Improvements in machinery to be used in finishing cloth and textile fabrics.

2763. Hudson Cranston, of Coronation-street, Sunderland, Durham. An improved method of manufacturing lozenges.

2767. James Leitch, sugar refiner, of Ellenborough-street, Liverpool, Lancaster. Improvements in melting, blowing up, and filtering sugars and other saccharine matters.

2769. John Gray, of Strand-street, Liverpool. Improvements in azimuth and amplitude instruments.

2771. Herman John Van den Hout, artist, and Ebenezer Brown, carver, of Kentish-town, Middlesex. Improvements in utilising leather shavings.

Dated December 8, 1855.

2773. Charles François Jules Fonrobert, of Berlin, Prussia. An artificial leech and a sucker.

2775. William Norton, of Kirkburton, York, manufacturer. Improvements in weaving pile fabrics.

2777. François Devos, of Rue Drouot, Paris. Improvements in preparing and tanning hides and skins.

Dated December 10, 1855.

2779. Joseph Wrigley, of Oldham, Lancaster, manufacturer, and Jacob Norcliffe, of the same place, overlooker. Improvements in shuttles, and in the method of using the same.

2781. James Cocker, of Liverpool, Lancaster, wire-drawer. Improvements in the manufacture of wire.

2783. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture of safety-paper. A communication from Victor Courboulay, of Place du Caire, Paris, France, civil engineer.

2787. Josiah George Jennings, of Great Charlotte-street, Blackfriars-road, Surrey. An improvement in the arrangement of the over-flow pipes of baths, wash-hand basins, and other vessels.

2789. Josiah George Jennings, of Great Charlotte-street, Blackfriars-road, Surrey. An improvement in the rising-pipe and suction-valves of pumps.

Dated December 11, 1855.

2791. Bernard Hughes, of Rochester, New York, United States. A knot-tying sewing-machine. A communication.

2793. Jean Marie Préaud, of Lyons, France. Certain improvements in India-rubber springs.

2797. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. An improved apparatus for discovering the leakage or escape of gas. A communication from Etienne Abram Maccaud, of Paris, France, gentleman.

2799. Robert Adam Whytlaw, of Glasgow, Lanark, manufacturer, and James Steven, of the same place, mechanic. Improvements in weaving.

2801. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improved machinery for manufacturing bolts. A communication.

2803. Samuel Clarke, of Albany-street, Regent's-park, Middlesex. Improvements in lanterns for affording light, and for cooking.

Dated December 22, 1855.

2900. Myles Kennedy, of Ulverstone, Lancaster, and Thomas Eastwood, of Preston. Improvements in pump-buckets, which improvements are also applicable to lift-pumps, air-pumps, and all similar apparatus.

2902. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in furnaces for steam-boilers and other heating purposes. A communication.

2904. Christopher Dresser, of Waterloo-cottage, Waterloo-street, Hammersmith. Improvements in the mode of effecting what is called "Nature printing."

2906. Edward Rowcliffe, of 2, Gloucester-terrace, West-grove, Blackheath. Improvements in the manufacture of blocks or slabs for paving or building purposes.

2908. David Dick, engineer, of Paisley, Scotland. A new and improved regulator for gas.

Dated December 24, 1855.

2910. Frederic Holdway, of Mount-street, Grosvenor-square, Middlesex, coachmaker. Improvements in carriages and various parts of the same.

2912. Thomas Cowburn and George Walker Muir, of Manchester, Lancaster, engineers. Improvements in steam-boilers, and in valves and parts connected therewith.

2914. Christian Ernst Offhaus, of Newark, New Jersey, United States. Improvements in rotary steam-engines.

2916. John Barton, of Stockport, Chester, shuttle manufacturer. Improvements in shuttles or shuttle-tongues.

Dated December 26, 1855.

2918. Alexandre Tolhausen, of Duke-street, Middlesex, sworn interpreter at the imperial court of Paris. Certain improvements in railway axle-boxes. A communication from G. W. and T. C. Geisendorff, United States.

2920. John William Lewis, of Manchester, Lancaster, engineer. An improved picker for looms.

2922. Sylvanus Sawyer, of Massachusetts, United States. An improved bomb-shell.

2924. David M'Cullum, of Victoria-place, Stonehouse, Devon. Improvements in electric telegraphs.

Dated December 27, 1855.

2926. Simon Petit, of Versailles, France. A new or improved apparatus for buoying ships or vessels, and also drawing them out of water.

2928. Alfred Krupp, of Essen, Prussia, cast steel manufacturer. Certain improvements in gun and gun-carriages.

2930. Edwin Ladmore, of Birmingham, Warwick, assistant superintendent of small-arms. A new or improved method of securing ramrods to military fire-arms.

2932. John Grist, of Islington, Middlesex, engineer. Improvements in machinery for the manufacture of staves and parts of casks, and for forming them into casks, barrels, and other like vessels.

Dated December 28, 1855.

2934. John Robinson, of the firm of Sharp, Stewart and Co., of the Atlas Works, Manchester, engineers, and Richard Cunliffo and Joseph Anthony Collet, of the same place, mechanical draughtsmen. Improvements in locomotive steam-engines, and in springs for locomotive steam engines and other purposes.

2936. Thomas Fielden Uttley, of Mytholm Royd, York, manager. Improvements in the mode of applying fusible plugs to steam-boilers.

2938. George Chisholm, of St. John's-square, Clerkenwell, Middlesex. Improvements in the manufacture of artificial manure.

2940. Henry George Baily, of the Vicarage, Swindon, Wilts, clerk. Improvements in machinery for digging and forking land.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January* 15*th*, 1856.)

1951. Charles Pope Rosson. Certain improvements in machinery or apparatus employed for dressing and finishing textile fabrics, by the application of a new material in the place of hogs' bristles or wire cards hitherto employed therein.

1980. William Smith. An improved smoke-consuming furnace. A communication.

1984. Thomas Joseph Larmuth and John Smith. Improvements in machinery or apparatus for printing.

1991. John Humby. An improved machine for cutting vegetables.

1999. Thomas Taylor Coniam. Improvements in tiles for roofing.

2008. William Craymer. Improvements in propelling vessels.

2043. Eugène Grenet, junior. An improved electro-magnetic apparatus for motive-power, part of which may be employed separately for the generation of electric currents.

2052. Josiah Gimson. An improved feed apparatus for steam boilers.

2059. Etienne Charles Zacharie Bouchard. Certain improvements in producing gas for lighting and heating.

2062. Joseph Partridge. Improvements in malt crushers.

2067. Pierre Bernardet de Lucenay. Certain improvements in the batteries of guns and pistols.

2071. Abram Longbottom. Improvements in the manufacture of gas when oils or fatty matters are used.

2073. JeanPierre Garbai. An improved powder or composition for cleaning and preserving the teeth.

2085. David Hill. Preparing a material capable of resisting fire, and especially suitable for the interior of puddling and other furnaces.

2104. James Dellagana. Stereotyping type high, that is to say, as high as common printing type, or seven-eighths of an inch high.

2113. George Arthur Biddell. Improvements in railway crossings.

2166. Robert Robey and George Lamb Scott. Improvements in locomotive and other boilers.

2195. George Rennie. Improvements in steam-engine boilers, as applied to the propulsion of vessels.

2204. William Ramscar. Improvements in fire-arms, which improvements are also applicable to cannons and all kinds of field-pieces.

2315. James Fraser. An improvement in the manufacture of paper, or paper pulp. A communication.

2360. Alexander McGlashan and Edward Field. Improvements in printing-presses.

2425. James Gray Lawrie. Improvements in shipbuilding, to facilitate the use of water as ballast.

2435. Henry Laxton. Improvements in gearing for increasing or decreasing rotary speed. A communication.

2452. Werner Staufen. A substitute for hair and other substances commonly employed for stuffing cushions, furniture, and other articles.

2458. James Eastwood. Certain machinery or apparatus for taking out the slubs, noils, and knots from worsted, sliver, slubbing, and roving.

2460. George Davis. Improvements in apparatus for letting in or shutting off water or other liquids.

2504. Louis Benoit Advielle. An improved process for silvering metallic articles.

2537. Louis Joseph Frédéric Margueritte. Certain improvements in the manufacture of vitreous products.

2560. Henry Laxton. Improvements in fire-arms. A communication.

2655. Louis Joseph Frédéric Margueritte. Improvements in precipitating certain salts.

2683. Charles Jean Baptiste Barbier. An improved kiln for burning or firing pottery, bricks, tiles, and other earthenware.

2705. Edward John Davis. Improvements in preparing food for horses and other animals.

2709. William Needham and James Kite. Improvements in machinery or apparatus for expressing liquids or moisture from substances.

2723. Samuel Garn. An improved tipping apparatus applicable to carts and other vehicles.

2726. William Foot. An instrument for moving and stopping trucks and other carriages on railways.

2727. Joseph Barling. An improvement in the manufacture of paper by the application of a root not before used for the purpose.

2753. Rudolph Bodmer. An improved planimeter. A communication.

2775. William Norton. Improvements in weaving pile fabrics.

2792. Jacques Elidat de Malbec. Certain improvements in water-closets.

2799. Robert Adam Whytlaw. Improvements in weaving.

2801. Alfred Vincent Newton. Improved machinery for manufacturing bolts. A communication.

2803. Samuel Clarke. Improvements in lanterns for affording light and for cooking.

2828. Edward Orange Wildman Whitehouse. Improvements in apparatus for measuring fluids.

2830. William Henry Newman. An improved fire-lighter.

2842. Paul Marie Salomon and Charles Marie Joseph De Flers. Improvements in the manufacture of gas from coals, and in the production of bituminous coke in that manufacture, and also in the apparatus connected therewith.

2844. George Collier, John Crossley, and James William Crossley. Improvements in apparatus employed in drying and stretching woven fabrics.

2910. Frederic Holdway. Improvements in carriages, and various parts of the same.

2922. Sylvanus Sawyer. An improved bomb-shell.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

59. Francis Parker and William Dicks.
62. Joseph Beattie.
71. Henry Constantine Jennings.
72. James Thornton, John Thornton, and Albert Thornton.
80. James Fletcher.
82. John Arrowsmith.
88. Frederick Lawrence and Alfred Lawrence.
93. John Rumley.
102. Frederick Joseph Bramwell and Isham Baggs.

LIST OF SEALED PATENTS.

Sealed January 8, 1856.

2247. William Edward Newton.
2337. Doctor Graham.
2347. Henry Giller.
2381. John Edwin Mayall.
2390. Joseph Robinson.
2405. Edwin Tomlinson and Alfred Mortimer Job.
2443. Robert Kerr.
2479. William Henry Walenn.

Sealed January 10, 1856.

1544. Henry Pratt.
1552. Thomas Wright Gardener Treeby

Sealed January 12, 1856.

1557. Benjamin Greening.
1558. John Robinson and William Wedding.
1560. Frederic Howorth Edwards.
1565. Romain Denis Obissier.
1566. Joseph Henry Tuck.

1568. Thomas Redmayne.
1571. George Tomlinson Bousfield.
1592. Ludovico Gavioli.
1620. Auguste Edouard Loradoux Bellford.
1623. Vincent Scully and Bennett Johns Heywood.
1627. James Gray Lawrie.
1646. Casimir Deschamps and Charles Vilcoq.
1648. William Striby.
1661. Theophilus Henry Hastings Kelk.
1673. Joseph Westwood and Robert Baillie.
1681. Tony Petitjean.
1718. François Georges Hyacinthe Levavasseur.
1749. James Saunders.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

R. N. B.—If you made no mention of your escapement in your provisional specification, you positively cannot claim it when you lodge your final specification.

B. Cheverton and *A. Brandram.*—Yours in our next.

CONTENTS OF THIS NUMBER.

Peters' Improved Steam Engines—(*with engravings*) ... 49
Faraday's Experimental Researches in Electricity (*continued from page* 9) ... 51
Institution of Civil Engineers. Address by R. Stephenson, M.P., President ... 56
Rye's Improved Railway Wheels (*with engravings*) ... 58
Balan's Aerial Railway (*with engravings.*) ... 59
The Compasses of Iron Ships ... 60
Ventilating Brick-work for the Dwellings of the Poor ... 61
Siemen's Improved Air-Pump ... 61
"The Practical Engineer's Pocket Guide;" "The Practical Mechanics' Pocket Guide;" "The Universal Calculator's Pocket Guide;" "The Practical Mathematician's Pocket Guide;" all by Professor Wallace: and "The Practical Chemist's Pocket Guide," by W. Hope, M.D. (*Notice*) ... 61
Captain Norton's Cartridges ... 62

Specifications of Patents recently Filed:

Bakewell	Revolving Fire-arms	62
Avery	Oscillating Engines	62
Turner and Turner	Crushing Grain	62
Moxon and Clayton	Looms for Looped Fabrics	63
Betteley	Iron Knees for Ships	63
Betteley	Ships' Anchors	63
Cottam	Stable Fittings	63
Biddell	Cutting Vegetables	63
Hollis	Ramrods	63
Enouy	Fire-arms	63
Leloup	Separating Vegetable from Animal Substances	63
Lister	Silk Waste, &c.	63
Chance	Glass-flattening	63
Hewitt	Propelling	63
Clay	Bar Iron	64
Clay	Bar Iron	64
Bridgewater	Spikes for Railways, &c.	64
Mathis	Preserving Wood	64
Sadler	Looms	64
Morrell	Ink-bottles	64
Pallier	Soap	64
Jones	Punching and Shearing Metals	64
Webster	Balances	64
Sellars	Starch	64
Carlhian and Corbiere	Moderator Lamps	64
Real	Elastic Bottoms for Beds	64
Peaker & Bentley	Grinding Grain	64
Bessemer	Propellers	65
Little	Printing	65
Bessemer	Cast Steel	65
Blanchard	Bending Timber	65
Bessemer	Ordnance	65
Bessemer	Steel Rolls	65
Bessemer	Railway Wheels	65
Jones	Motive Power	65
Johnson	Furnaces	65
Hartmann	Printing Stuffs	65
Burke	Paper Pulp	66
Macintosh	Fuses, Fusees, and Matches	66
Gover	Gun Carriages	66
Letchford	Folding Bedstead	66
Johnson	Emptying Cesspools	66
Johnson	Storing Grain	66
Holmes	Gas	66
Walker	Electric Telegraphs	66
Savage	Swing Doors	67
Lane	Pumps	67
Cochaud	Gaseous Liquids	67
Pol	Pianofortes	67
Newton	Finishing Thread	67
Fabien	Wheels	67
Jullion	Paper, &c.	67

Provisional Specifications not proceeded with:

Barrington and Le Fanu	Bridge-rails	67
Bardo	Pocket-cases	67
Johnson	Metallic Pens	67
Coulson	Sulphate of Baryta	67
Metcalfe	Collapsible Hats	68
Blackman	Syrup	68
Henson	Buildings	68
Lodge and Marshall	Naphtha	68
Sinclair	Railway signals	68
Robertson	Packages	68
Lee	Water-closets	68
Vaudelin	Railway Breaks	68
Wilding	Furnace-bars	68
Francis	Cutting-out Garments	68
Myers	Raising Water	68
Myers	Buffers and Springs	68
Norton	Measuring Fluids	69
Dixon and Bailey	Taps	69
Johnson	Dish-covers, &c.	69
Herts	Harness	69
Longridge	Steam Boilers & Tubes	69
Green	Lamps	69

Provisional Protections ... 69
Notices of Intention to Proceed ... 70
Patents on which the Third Year's Stamp Duty has been Paid ... 71
List of Sealed Patents ... 71
Notices to Correspondents ... 72

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1694.] SATURDAY, JANUARY 26, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

HUNT'S PATENT ADVANCE-BLADED CONOIDAL SCREW-PROPELLERS.

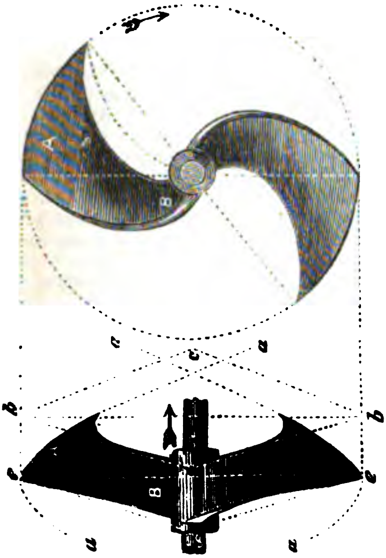


Fig. 2.

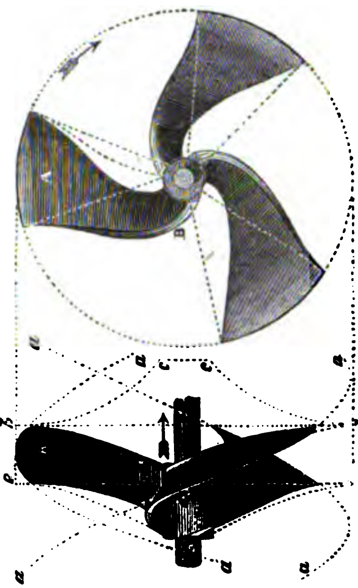


Fig. 4.

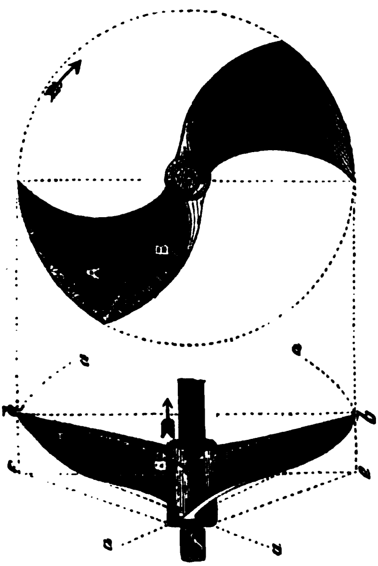


Fig. 1.

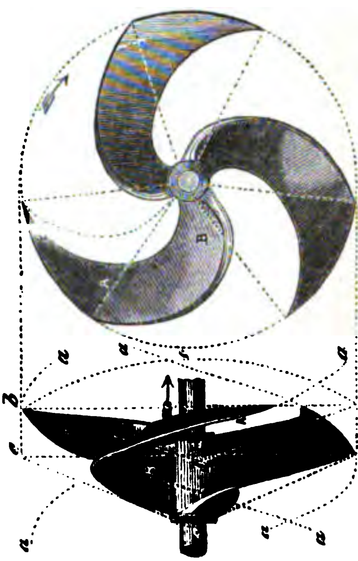


Fig. 3.

HUNT'S PATENT ADVANCE-BLADED CONOIDAL SCREW PROPELLERS.

An improved form of propeller, called "the advance-bladed conoidal screw propeller," for which the inventor, apparently with good reason, claims many important advantages, is now being introduced by Mr. Edmund Hunt, of Glasgow. His object in inventing the improved propeller has been to get rid, as much as possible, of the resistance offered by the central portion of the ordinary screw to its passage through the water. He says, "Mr. Griffiths attempts to get over the difficulty by filling up the central part of the propeller with a large sphere, and with his screw he has obtained as good results as have been yielded by the common screw. This, however, only proves that the action of the central part of the common screw is defective; it is, in fact, the substitution of one bad thing for another. It is obviously a bad thing to make a propeller unnecessarily drag through the water an immense sphere, one-third of its own diameter in size. If a propeller with such a drag equals the common screw in its performance, the direct conclusion is, that the latter is defective to an extent equal to this drag. A further conclusion is, that if we can obviate this defective action of the common screw without substituting the spherical drag, we shall obtain a superior propeller.

"In order to cure the defective action in the common screw," he continues, "we must first analyse it. A great portion of the power, which is said to be lost in using screw propellers, is dissipated in causing the recession of the water from the blade, and anything which facilitates this recession may be considered as occasioning a loss of power. If the propeller could impel the water backwards in parallel lines, or in converging lines, so as to accumulate it behind it, as it were, the water would not as easily recede, as if it were impelled in such a manner as to spread out in diverging lines. Now the central part of a common screw blade impels the water in divergent lines, that is, it has a centrifugal or divergent action. In the common screw, this action is chiefly injurious in disturbing the water acted upon by the outer and more efficient part of the blade, and in causing it to recede more easily. The blade, in fact, acts on broken water, and does not meet with that resistance to recession which undisturbed water would yield. Looking at the action of the common screw in this light, a facile way of improving it, and getting rid of the defect to a great extent, if not altogether, at once suggests itself, namely, by placing the outer portion of the blade as much as possible in advance of the central part." This arrangement of the blade forms the main feature of his Advance-bladed Screw.

Several screw propellers have been tried, in which the acting surfaces have been curved or inclined backwards, with the view of obviating divergent or centrifugal action; but these propellers have been so shaped, Mr. Hunt believes, that the outer and more efficient portions of their blades lie more in the path or sphere of the centrifugal disturbing action of the central portions, thus neutralizing any benefit that might be expected from the backward inclination or curvature of the acting surfaces.

In some modifications of his advance-bladed conoidal screws, Mr. Hunt combines a curved or inclined acting surface with an outline form of blade, wherein the outer and more effective part of the blade is in advance of the central part, in order to obtain the increased effect due to the curvature or inclination of the acting surface, undiminished by the disturbing action of the central part.

The following is the inventor's own description of the engravings on the preceding page: —The improved screw propeller is represented in fig. 1, in side and end elevation, the latter as looking on the acting face. It is exactly like the common screw, as far as regards the kind of acting surface given to it; for, if this surface is cut by a plane passing through the shaft, the line of intersection will be a straight line, *b b*, at right angles to the shaft, as is equally the case in a common screw. Instead, however, of the blade being cut straight down to the shaft on its entering and back edges, as in the common screw, it is made with these edges gradually sloping backwards from the outside towards the centre. In other words, the entering or front edges of the blades are such as will lie on the surface of a cone, indicated by the dotted lines, *b d b*, whilst the back edges are such as will lie on the surface of a similar cone, *e f e*. By these means the outer portions, A, of the blades are thrown in advance of the central portions, B, and are thereby enabled to act on water, undisturbed by the latter. The arrows indicate the direction in which the screw propels a-head, and the dotted lines, *a a*, indicate the helical paths of the circumferential edges of the blades. The same letters refer to similar parts in the several figures. In the screws represented in figs. 2, 3, and 4, the advancing of the outer portions of the blade is combined with a backward inclination of the acting surface. Thus, in fig. 2, the line of intersection, *b, c*, which a plane passing through the shaft would make with the surface of the blade, is a straight line inclined backwards from the shaft, and not at right angles to it, as such an intersecting line would be in a common

screw. This makes the acting surface slightly hollow, and gives the blade an increased hold on the water, without, however, in the least degree, impeding its recession in the proper direction. In the propellers represented in figs. 3 and 4, the line, *b*, *c*, of the intersection with the acting surface of a plane passing through the shaft is curved, instead of being straight, as in fig. 2. In fig. 3, the line, *b*, *c*, is more inclined backwards towards the outside, whilst in fig. 4, it is more inclined backwards towards the centre. It is considered that the kind of propeller blade represented in fig. 3, will be better adapted for vessels with proportionately small power, whilst, for vessels with full power, the modification represented in fig. 4, will be more suitable.

Mr. Hunt's invention is, of course, applicable to screws with any number of blades. The screws represented in the engravings are of uniform pitch; that is to say, they would work through solid close-fitting nuts; they may, however, be made with an increasing or expanding pitch if desired. The blades may be strengthened to any extent without affecting their efficiency, by adding material to the central part of the back edge; that is, by making this part longer on the shaft, the increased length being added to the after edge.

Messrs. Neilson and Co. are at present constructing two screws with Mr. Hunt's improvements, and we hope before long to lay before our readers the results of trials that are to be made with them.

At page 567 of our sixty-second volume (No. 1662), we partially promised to publish a more lengthy account than we then had space for of the invention of which the improved screws described above form a part. We will therefore add, that in addition to the foregoing screw propellers, Mr. Hunt at the same time patented* the following improvements:

First. A means of constructing screw propellers with flexible blades. The kind of propeller blade to which this portion of the invention refers consists of metal ribs combined with caoutchouc or other suitable flexible material, such material filling up the spaces between the ribs, and forming the external covering and acting surface. The ribs are wrought-iron rods, each set of two or more (according to the number of blades of which the propeller is made to consist) being made in one piece, with a central boss formed with an eye, and carried by the propeller shaft. Two or more such bosses, with their radiating or curved ribs, make up the propeller, and a portion of the invention consists in separating the bosses and interposing caoutchouc rings, or any other suitable kind of springs, between each pair of bosses. In addition, the rib bosses may be fitted on the shaft with inclined feathers and grooves or screw threads. The object of these contrivances is to relieve the outer portions of the blades from strain or excessive stretching; for, according to this plan, when the blades assume a finer pitch, which their flexibility enables them to do on certain occasions, the rib bosses approach each other, thereby contracting the axial length of the blade: and on the pitch becoming finer, a certain amount of material will not require to stretch so much if the axial length of the blade is reduced, as it would were the axial length to remain the same, notwithstanding the alteration in the pitch. When a propeller of this kind is at rest, the ribs assume positions in a line with the shaft; but when it is caused to revolve, the after portions of the blades become twisted round the shaft.

Secondly. Various modifications of contrivances for effecting the swivelling of the blades of oblique-bladed propellers, for a description of which we have not space.

Thirdly. An improvement which relates to such of the propellers previously described as are capable of assuming different pitches in obedience to the variations in the resisting action of the water, and consists in connecting such propellers with the throttle or expansion valve of the driving engines, so that when greater resistance is met with, and the pitch or inclination of the propeller blades becomes finer, more steam may be admitted to the engines to enable them to maintain their rate; whilst, on the other hand, if the resistance is reduced—in consequence, for example, of the propeller being out of the water—the supply of steam may be instantly diminished, the engines being thereby prevented from "running away."

Fourthly. An improvement which relates to the rudders of screw steamers, being more particularly applicable to vessels with double sterns and two propellers. This improvement consists in employing a single rudder placed at the bow of the vessel.

Fifthly. An improvement which relates to the general shape of sea-going vessels, particularly screw steamers, the main object being the attainment of a cleaner run or stern than has hitherto been given to such vessels. In carrying out this improvement, Mr. Hunt so designs and proportions his various sections that a flat or convex run is obtained, such run rising up gradually along the rearward portion of the vessel, and passing up above the water line at the stern. He adopts this description of run for the purpose of admitting the

* Patent dated November 21, 1854.

water more freely to the propeller; it also admits of the propeller or propellers being placed further forward than in vessels having the common kind of run. He also considers this form of run to be advantageously applicable in all cases, without reference to the system of propulsion adopted; that is to say, it is applicable to paddle steamers and sailing vessels as well as to screw steamers.

RAMSBOTTOM'S IMPROVED SAFETY VALVES AND FEED APPARATUS FOR BOILERS.

Mr. John Ramsbottom, of Longsight, has recently introduced an improvement in safety-valves, which consists in applying a cross bar to two or more safety valves, and in loading the valves by a spring or weight connected to the cross bar; and also an improvement in feeding steam boilers, which consists in supplying the feed pumps of locomotive engine boilers from a cistern, which is placed under the cylindrical part of the boiler or the foot plate, or under both.

Fig. 1 of the accompanying engravings is a sectional elevation of one mode of carrying out his improvements in safety valves. *a a*, are two safety valves, the seatings of which are made in the columns, *b b*. These columns are attached to the cover, *c*, which closes the man hole, *d*, fixed on

Fig. 1.

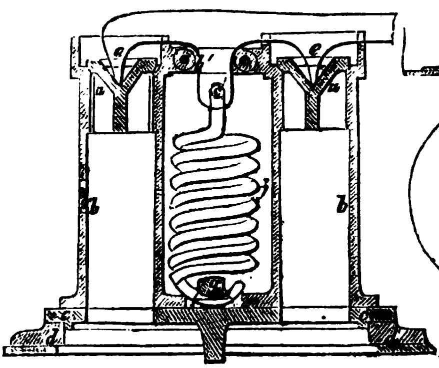
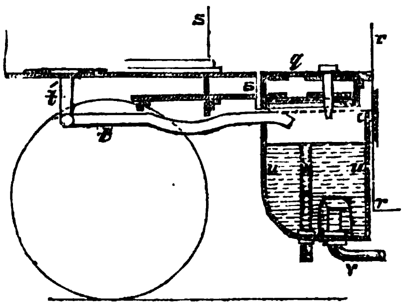


Fig. 2.



the steam boiler in the ordinary manner. The valves, *a a*, are made with conical recesses to receive the points of the cross bar, *e*, and they are placed at such a distance apart as to admit of the spring, *f*, between them. This spring is of sufficient power to resist the pressure of steam on both the valves, and Mr. Ramsbottom prefers to make the point, *e'*, of attachment of the spring, *f*, and cross bar, *e*, below the bearing points of the bar, *e*, on the valves, *a*. The lower end of the spring, *f*, is secured to the cover, *c*, and the pressure adjusted by the bridle, *g*, or in any other convenient manner. The columns, *b b*, are connected by the stays, *b'*, which are bolted to snugs projecting from the columns. These stays serve to preserve the distance between the columns; and in case of the spring, *f*, breaking, they act as a guard to prevent the blowing away of the cross bar and valves. The cross bar, *e*, is prolonged at one end to serve as a handle for the attendant to ascertain the working condition of the valves. By depressing the handle, the valve nea the handle serves as a fulcrum for raising the other valve off its seating, thereby causing it to let off steam; on raising the handle the contrary action takes place.

When the pressure of the steam in the boiler is sufficiently great to overcome the resistance of the spring, *f*, the valves are raised; but if in rising one of the valves rises more than the other, the cross bar, *e*, causes the spring, *f*, to lean towards the valve that has been raised the most, owing to the point of attachment of the spring being lower than the point of the lever bearing on the valve, thereby relieving the valve that had risen the least of a part of its load. This arrangement tends to secure the simultaneous action of both the valves.

Mr. Ramsbottom also adopts a modification of the foregoing arrangement, in which the spring is applied above the cross bar, *e*. This spring bears on a bush, fitting easily on a standard, which is fixed to the cover; the lower portion of the bush is shaped

to fit in a groove in the cross bar; and the upper end of the spring fits in a cap, which is held down by lock nuts. These lock nuts also serve to regulate the tension of the spring so as to suit the pressure at which it is desired to work this steam in the boiler. The action of this valve is similar to that above described.

He also adopts another modification of his improvements, in which the valves are loaded by means of a volute spring, which is held in a recess or well in the cover by means of a lid. The spring is connected to the cross bar by a rod and nut, and the tension of the spring is regulated by other nuts which screw down the lid.

Mr. Ramsbottom also provides for loading three valves with one cross bar, if it is thought desirable. The cross bar for this arrangement has three arms, to bear upon the three valves, which are loaded by means of a weight suspended to the cross bar. A spring may be used instead of the weight to load the three valves, and weights may be used instead of the springs mentioned in the arrangements already described.

The improved safety valves may be boxed up, and provided with funnels, to convey away the steam that blows off, as in other safety valves, and the pressure on the valves, when once adjusted, cannot be tampered with. When these valves are applied to locomotive engines, the ordinary spring balances usually employed are dispensed with.

There is clearly no friction in these valves except between the feathers of the conical valves and the inner surface of the seatings, and when Mr. Fenton's spherical valves (described in our 61st Volume, p. 529, No. 1634,) are used, even this small quantity is removed.

We are given to understand that the arrangement, fig. 1, is now in use upon the London and North Western Railway, both with the conical valves as shown, and with the spherical valves just referred to, and that both as respects sensitiveness of action and great range of lift, under a given excess of steam pressure, they have proved to be much superior to any of the ordinary lever arrangements.

Fig. 2 is an elevation in section of part of a locomotive engine and tender, to which the improved feed apparatus is applied. *q* is the foot-board of the engine, and *r* is part of the fire-box; *s* is part of the tender; *t* is a pipe attached to the tender, and connected by the cross pipe, *t'*, with the ordinary feed valves; *u* is a cistern attached to the engine, and placed below the foot-board, *q*; *v*, *v* are pipes for connecting the cistern, *u*, with the feed pumps, which are made in the ordinary manner; *w* is an overflow pipe, to carry off the water in case the feed valves are not closed in time. When the pumps are set to work the water is drawn from the cistern, *u*, which is supplied from the tender by the attendant opening one or both of the feed valves. The feed pipe on one side of the engine rises about six inches above the bottom of the cistern, whereas the other pipe is level with the bottom. The object of this is to keep one pump out of play so long as the other will supply the requisite quantity of water. By this arrangement the connecting pipes, with ball and socket joints or flexible tubing, hitherto employed for conveying the water from the tender to the feed pumps, are dispensed with, and in uncoupling the engine from the tender it is only necessary to take out the draw bar and safety pins. The waste steam pipe, which under ordinary circumstances is connected with the feed pipes, is turned into the cistern, *u*, which holds sufficient water to condense the waste steam that is blown off at any ordinary stoppage. It is evident that when there is not space for a cistern of sufficient size under the foot-board, an additional cistern may be placed under the cylindrical part of the boiler.

A NEW AND IMPORTANT PROCESS OF ENGRAVING.

M. Giuseppe Devincenzi, of Grosvenor-street, London, has recently invented a very important electro-chemical process of engraving, which has been reported upon most favourably in France by a committee composed of Messrs. Becquerel, Chevreul, and Seguier. M. Devincenzi has devoted himself for several years to the pursuit of a series of researches on the art of producing engraved surfaces for printing and embossing, and has taken out two British patents, dated respectively the 3rd and 15th of April, 1854, for improvements in the art. The following is a description of his new process.

The metal best adapted for this kind of engraving is zinc. It is employed in laminated plates which are ground with sifted sand, and the design is made on it with ink and the lithographic crayon. The design being executed, the plate is prepared as if it were to be used for lithographic drawing. For this purpose it is steeped for a minute in a decoction of nut-galls. It is washed with pure water, and covered with a weak solution of gum arabic. The plate is moistened with a sponge, the design is effaced with essence of turpentine, and a lithographic cylinder endued with a varnish is rolled over it. This varnish accurately covers all lines made by the designer. The varnish should have the following qualities:—1. Of

not injuring the design; 2. Of adhering strongly to the plate; 3. Of not being attacked by the chemical agents employed for engraving.

The varnish known in England as "*Brunswick black*," mixed with essence of lavender, is preferable to all others. This varnish is composed of asphalte, boiled linseed oil, litharge, and turpentine. When the varnish is dry, the zinc plate is put in communication with a copper plate at the distance of 0·005; after which, they are steeped in a solution of sulphate of copper marking 15 degrees; a voltaic pair is thus formed; the sulphuric acid resulting from the decomposition of the sulphate of copper dissolves all the parts of the zinc which are not covered. More or less depth is given to the engraving, according to the kind of design. Crayon designs are generally engraved in four or five minutes, and those with the pen in six or seven minutes. Sulphate of copper does not produce *any alteration* in the most delicate drawings, and does not act on the varnish.

This method of engraving may be applied to all the other processes, by means of which a design may be reproduced. We may draw on paper and afterwards transfer the design on to plates. The impressions of lithographic stones, copper, and steel plates, may be transferred. These machines may be employed on zinc as well as on lithographic stones for producing flat tints. The process is likewise applicable to *printing characters*. It suffices to have a page of a book transferred to a plate of zinc to make a stereotype of it.

This mode of engraving will replace the ordinary stereotype. By means of it we may transfer the page of a book, when it is being printed, on to very fine sheets of zinc; and from the latter to thicker plates in order to engrave them as often as they have to be reprinted. Hence results great economy in composition and paper, since there is no need to have large impressions. A copy on very thin sheets of zinc does not cost more than a copy taken on good paper.

The stereotypes may be applied to two other means of typographic reproduction. It is not difficult to transfer from an old impression on to metellic plates; and we may thus obtain other tereotypes of old books.

NAVAL PREPARATIONS FOR THE NEXT CAMPAIGN.

THE retirement of Sir James Graham from the Board of Admiralty, and that of Mr. Gladstone and others from their positions in the Government, were attended by statements which pretty clearly indicated why, in the first year of the present war, the strength of our dockyards continued to be expended upon the construction of large and unavailable ships of war, while but little or no effort was made, either in the Royal yards or by private contract, to prepare a fleet of such vessels as were absolutely essential to the successful prosecution of a war against a power which had planted its fortresses among rocks, and presented to its enemies a seaboard securely defended by shallows against the attacks of frigates and line-of-battle ships. Since that period the necessary changes in our naval departments have been made; and the country has now the satisfaction of knowing that it has in preparation a most effective fleet of mortar boats, gun boats, rafts, despatch vessels, and floating batteries, which will be certain either to menace Russia into an early peace, or to wring from her a more tardy one.

There are now employed in a private building yard on one of our new iron floating batteries no less than 220 men, the work proceeding night and day, and Sunday also, without intermission; and there are no less than 3,500 shipwrights who work on wood only, employed in the yards of private builders, in addition to those who are engaged on the iron vessels, and a proportionate number of joiners, sawyers, caulkers, labourers, &c.

It will be satisfactory to the public to learn that, in the event of peace being concluded before our small vessels are made of service in action, the Government will be able without difficulty to dispose of the whole of them for but little or nothing less than their actual first cost. We subjoin an authentic alphabetical list of all the private ship-builders who are now executing contracts for the Government.

Briggs	Sunderland.
Fletcher	Limehouse.
Green	Blackwall.
Harvey	Ipswich.
Hessell & Holmes	Rye.
Hill	Bristol.
Hoad	Rye.
Inman	Lymington.
Joyce	Blackwall.
Laird	Birkenhead.
Lungley	Deptford.
"	Northam.
Mare	Blackwall.
Miller	Liverpool.
Napier	Glasgow.
Palmer	Newcastle.
Patterson	Bristol.
Pitcher	Northfleet.
Russell	Millwall.
Samuda	"

Scott ....Greenock.
Smith ....Newcastle.
Thompson ....Rotherhithe.
Westbrook ....Blackwall.
White ....Cowes.
Wigram ......Blackwall.
„ ......Northam.
Young ....Limehouse.

ON TONNAGE REGISTRATION.

A paper on the above subject was read at the Society of Arts, on Wednesday evening, Jan. 16, by Mr. Charles Atherton, chief engineer of the Royal Dockyard, Woolwich. After reviewing the various enactments which have been enforced for regulating the admeasurement of shipping, the speaker recommended that the official survey of shipping should embrace the following details:

Name of vessel.
Year when launched.
Year when measured for registration.

Distance from keel to light draught. Distance from light to deep draught. Distance from deep draught to deck.	Midship Depths.

Length Breadth	At light draught	External Dimensions.
Length Breadth	At deep draught	
Length Breadth	At main deck	
Length Breadth	At light draught	Internal Dimensions.
Length Breadth	At deep draught	
Length Breadth	At main deck	

Distance from floor to light draught.
Distance from floor to underside of deck.

Length Breadth Depth	Deductions from roomage of spaces not available for the use of passengers or stowage of cargo.
Length Breadth Depth	Addition to roomage of covered in spaces above the main deck available for the use of passengers or stowage of cargo.

Engine power, with reference to some regulation unit.
Total area of the fire-grates.
Character of the lines of the vessel—whether very full, full, medium, fine, or very fine.

He also recommended that port records be taken of the draught of water at which all ships leave the port, showing the deficiency or excess as compared with the regulation deep draught line, and that the officially published records of shipping registration, such, for example, as that in the merchant navy list, shall embrace the following points:—1st. The Builders' measurement. 2nd. The displacement in tons weight available for cargo, or the cargo tonnage. 3rd. The nett roomage available for cargo, or the cargo roomage. 4th. The deep draught displacement of the ship, calculated to the regulation deep draught line; and 5th. The horse-power of steamers calculated with reference to some definite and legalised unit, and to be called the "Marine Horse-power."

For a full report of the paper, and an important discussion which followed, we refer our readers to the *Journal of the Society of Arts* of Friday, January 18th.

CANAL THROUGH THE ISTHMUS OF SUEZ.

It will be gratifying to all who have taken an interest in the practicability of opening up a ship canal between the Mediterranean and the Red Sea, to learn from the Report of Investigation, by the engineers who have recently been engaged on the survey, that no engineering difficulty presents itself to the carrying out of the project between Suez and Pelusium. It will be remembered that this is the line proposed by Mr. Lesseps—the particulars of which he detailed, in a work extensively circulated—about nine months since. The capital required will be about six millions; and if the money market continues to improve, the undertaking will be brought in an organized form before the public.

"For the moment we give," say the Commission, "the following conclusions:

"1. The line on Alexandria is not admissible in a technical and economical point of view.

"2. The direct line offers every facility for the execution of the maritime canal, properly so called, with a branch to the Nile, and the usual difficulties for the creation of the two ports.

"3. That of Suez will open upon a large and sure roadstead, accessible at all times, with eight metres of water at 1,600 metres from the shore.

"4. That to be formed in the Gulf of Pelusium, which the first plan placed at the end of the Gulf, will be placed 18 kilmotres more to the west, where there are eight metres of water at 2,300 metres from the shore, with good anchorage.

"5. The expense of the canal of the two seas, and of the works connected with it, will not exceed the sum of 200,000,000 f., as put down to the estimates of the engineers of the viceroy.

"The members of the International Com-

mission for cutting a canal through the Isthmus of Suez—

"F. CONRAD, President.
"A. RENAUD.
"NEGRELI.
"J. M'LEAN.
"LIEUSSON, Secretary."

The Limited Liability Act: with Introduction and Notes; and a Statement of the French Law relating to the Société en Commandite. By CHARLES WORDSWORTH, Esq., Barrister-at-Law, Counsel to, and Associate of, the Institution of Civil Engineers. Third Edition, enlarged. London: W. G. Benning and Co., Law Publishers, 43, Fleet-street. 1856.

THE enactment of the Limited Liability Law in the last Session of Parliament has afforded the means, which were long desired, of working useful patents by joint-stock companies. The Act, however, requires to be carefully studied by all who purpose availing themselves of the advantages it offers, and we strongly recommend our readers to possess themselves of this edition of it, which contains a very able and useful commentary upon it, by Mr. Wordsworth—whose preceding legal works are highly esteemed—together with an account of the French law regulating the *Société en Commandite*, and a Summary of Procedure in the Registration of Companies with Limited Liability. While the work is got up in excellent style, its price has been made extremely low, so that it may be within the reach of all classes.

The New Coinage considered in relation to our School Arithmetics, for the use of Teachers and Tradesmen; containing new simple rules for converting the present coinage into the new coinage and conversely; together with numerous examples of the new coinage in the various rules of Arithmetic. New Edition, revised and enlarged. By T. TATE, F.R.A.S. &c. London: Longman and Co. 1856.

THIS is a little brochure of six-and-thirty pages, the style and arrangement of which are good. We have already expressed our views on the subject treated of in this little publication, in which we observe nothing in discordance with those views. It has, however, one very important positive merit; its contents and its title-page are consistent with each other. Though the title-page promises nothing very extraordinary, yet it does promise something of value, and that something the interior supplies. Indeed we think it may prove very useful to those who desire the kind of knowledge it purports to contain.

SMOKELESS FURNACES AND FIRES.

EXPERIMENTS AT MESSRS. BRANDRAM AND CO.'S WORKS, ROTHERHITHE.

To the Editor of the Mechanics' Magazine.

SIR,—As you have kindly intimated to me that you would receive any communication I might have to make on the important subject of "smoke consuming," I venture to send you the following account of what has been accomplished in these works, and as an entire year has elapsed since the completion of the alterations necessary to this end, and the smoke *is consumed*, I feel quite confident that there is hardly any manufactory in the United Kingdom, in which the thing cannot be done, if it is set about in the right way. I will only add, that, mistrusting my own abilities, and doubting whether I could spare time personally to attend to this subject, I at first called in some patentees: these, to the number of three, failed to do what they professed, and, in fact, obstructed the business to such a degree that I went to work myself, and being very faithfully seconded by those about me, and especially the artizans, who entered fully into the spirit of the work, I eventually accomplished the end in view, and I feel certain I may call attention to the state of the tops of the many shafts in these works, as a proof of what has been done.

I am, Sir, yours, &c.,
ANDREW B. BRANDRAM.

Brandram's Works, Rotherhithe,
January 16, 1856.

The experiments made at these works, with a view to meet the requirements of the Act of Parliament, passed in 1853, for the "abatement of smoke in the metropolis," commenced with a tubular boiler, the dimensions of which are as follows;—28 feet long, 6 feet 6 inches diameter, having two tubes of 2 feet 6 inches diameter, with a fire in each. This boiler was driving two 35 horse-power condensing engines, by Boulton and Watt, at a pressure of steam of 3½ lbs., the utmost engine power ever required being 67 horses, and a high-pressure boiler, used for boiling oil, drying stoves, &c., &c., at an average pressure of from 30 lbs. to 40 lbs. The furnaces in these two boilers were the only ones that communicated with one large chimney shaft, and the patentees that were called in were ordered to fit up both boilers in order that, if smoke appeared, the sin of one should not be laid to the other. It will be sufficient to say that the patents which were tried *failed entirely;* the steam was never kept up beyond 2½ lbs., and at that the smoke was not consumed, and occasionally the steam *failed altogether.* The

patentees never troubled themselves to ask what work the boiler was wanted to do, but went to work, as I know to my cost, in the dark. Disgusted with this state of things, it occurred to me one day, when the smoke was pouring out of the chimney, and no smoke consumer was fitted, and the engines were exerting the full power required of 67 horses, to throw off the work, unknown to the engineer or stoker. This I did by degrees, until only 45 horse-power was left; at this point, after repeated trials, the stoker found it very difficult to make smoke, and I saw at once that this was at or near the point that, to maintain 3½ lbs. steam, a nearly perfect combustion of coals took place with ordinary care in stoking. In proportion as I exceeded 45 horse-power, so the smoke appeared. After this demonstration, I submitted the dimensions of the boiler, with the steam-power it was required to furnish, at the given pressure of 3½ lbs. to engineering calculation, when it was found to be just about one-third deficient in evaporative power, (although before ordering it of the boiler maker, the opinion, not only of experienced engineers but of practical men, had been carefully sought), thus verifying in a remarkable manner what I had arrived at by actual experiment. May there not be many owners of steam property, who, like myself, till pulled up by a Smoke Act, are utterly unconscious of over-driving their boilers? and can any patent invention be found effectually to consume the smoke under such circumstances? If any patentee has invented an apparatus to consume the smoke of a boiler driving 60 horse-power, that is only capable of driving 45 horse-power at a given pressure of steam, that patent is invaluable to parties who have only limited boiler room; but I can only come to the conclusion, after the failures I experienced, that such a thing is impossible, and that so long as boilers in and around the metropolis are forced, we shall not get rid of the smoke to that extent which is so devoutly to be desired. Fortunately, in my case, the difficulty was overcome by my having space to insert a second boiler, of the same dimensions, and by working the two together, I need hardly add I need no patent application for the consumption of smoke, neither is there any observable wear and tear of boiler or fire-bars. In the high-pressure boiler before alluded to, one patent still remains—that of Wright's, an arch over the centre of the fire—causing the black smoke in the front to pass under it, and rise over the bright fire at the back. This failed at first from the difficulty of keeping enough bright at the back; but I inserted a perforated iron plate under the fire, across the lower part of the tube, immediately under the said arch; and the boiler never being at very irregular work, the scheme is perfect. The rush of air to the extreme end of the ashpit is modified, and there is now no difficulty in keeping a bright fire, that suffers no smoke to pass, but converts it instantly into flame. Here also a uniform pressure of steam only is attainable; over 30 lbs. a larger fire becomes necessary, and instantly becomes unmanageable. The fire in front of the arch is not sufficiently robbed of its smoke to be pushed forward as bright fire, and the whole speedily becomes black together. The dimensions of this boiler are 14 feet 6 inches diameter, and the fire-flue is 2 feet 8 inches diameter. More high-pressure steam is now required, and there appears no method of getting it, and consuming the smoke at the same time, but by introducing a second boiler.

I believe this consumer of Wright's to be the best that has yet appeared, and it is a close approximation to Chanter's patent, which was worked under two wagon boilers in these works for twenty years, and reduced the consumption of coals from 9 lbs. to 10 lbs. per horse-power per hour to 5¾ lbs. by actual and often repeated experiments.

Having so far succeeded in abating the smoke from the steam boilers, the next object was to equally abate it in the chemical works, in which were upwards of forty fires, under what may really be termed "pots and pans," whose operations were dependent upon flame, so that there was no opportunity to use either coke or anthracite coal. Bearing in mind the effectual way in which the smoke from the black coal was instantly turned to account by Chanter's patent, this method was brought to bear, only in a widely different form, at first under a 700 gallon copper. The ash-pit was fitted with a wrought iron door, and a flue made into the chimney from just underneath the fire-bars. The operation was as follows: Immediately after putting on fresh coal the usual outlet into the chimney was stopped by a damper, above which entered the ash-pit flue, causing the smoke to pass downwards through the whole of the previous live fire. The draught having been thus reversed, the ash-pit flue came into operation; and when the smoke was consumed the ash-pit door was opened, and the damper drawn and the fire allowed to take its usual course.

This, although it acted perfectly, checked for the time being the operation, and retarded the work so much that it was necessary to alter the arrangement, which was done in this way:—The fire-place was divided in half, and fitted with two fire-doors and

two ash-pits. These fires were connected at the back, and each had a separate flue, with a damper in each. The operation of firing was as follows. A bright fire having been obtained on first starting in the right fire-place, a second fire was lighted in the left fire-place, and the damper of that flue shut. It is evident that under this arrangement the black smoke of the new fire passed over the bright fire, and as none of it came out of the chimney top, there could be no doubt it was consumed. Thus the fires being once got up in this way, alternate throughout the day; and with patience and perseverance in instructing the workmen they have at last become so used to the method, that unless the firework has become faulty, which it rarely does till the pot itself is burnt out, the combustion of the smoke is most perfect. The total expense of fitting the furnaces on this plan was little short of 300*l.*, all of which it is quite certain is being saved. It must be observed, that in chemical work the fires at the close of each operation are obliged to be either partially or wholly drawn, and relit again on commencing; this of course would occasion smoke, but even this has been remedied by care and attention on the part of the workmen, who found that in process of time they had such complete command over the fires with the dampers, that they can now work throughout the day without causing smoke at all (instead of throughout the operations, as at first), without the least trouble.

With respect to the saving of fuel effected, it is hardly to be recognized under the smaller apparatus, say the pan of 100 or 150 gallons, while under that of 700 or 800 gallons, and in long fires under flat and shallow evaporators, it reaches nearly 12 per cent. and almost any rubbish can be burnt with impunity.

I leave the subject here, having, I trust, stated sufficient to show, what must be aprent to every passer by, that a manufactory can be carried on in a densely populous neighbourhood without subjecting the inhabitants to the nuisance of living in a continual smother. A. B. B.

ON THE CALORIC ENGINE, AND ON THE NATURE OF MOTIVE POWER.

To the Editor of the Mechanics' Magazine.

Sir,—Your last number* presents us with a new edition of the Caloric Engine, with alleged improvements of a very singular character. Mr. Ericsson certainly displays great talent in devising mechanical riddles wherewith to puzzle the engineering world. This ingenuity is unquestionable; but it is thrown away on inventions which betray, in a very remarkable manner, the absence of true philosophical conceptions of the physical ideas embodied in their operations; and their fallacies are so curiously concealed in his contrivances, that he is not only led astray himself, but many sensible persons are induced to follow him in pursuit of the *ignis fatuus* of his vagrant imagination. It is singular, however, that the staid practical talent of America should for a moment have laboured under the hallucination of giving credit to an invention in which nothing less than the perpetual motion was the object to be realized; for that such was the character of the fallacy embodied in the theory of the caloric engine, I had the honour of showing in a paper read before the Institution of Civil Engineers, at a time when the success of the invention was announced in the United States as a triumphant fact. This will be seen in the following extracts:

"Caloric, in the mechanical view of the subject, is known simply as a force. Now a force whose action does not imply, to the same extent, its extinction, in reference to the body to which it primarily belonged;—or a force which, admitted to become for an instant extinct in one body, by transmission to another, is the next moment capable of becoming self-recruited, are assumptions inconsistent with all natural phenomena, and involve a manifest impossibility. Yet the 'caloric engine' is chargeable with this absurdity, so far as it is founded on the principle 'that the production of mechanical force is unaccompanied by the loss of heat,' and that 'caloric can operate over and over again.' In truth, it amounts to nothing less than affirming the principle of perpetual motion—affirming that power can be gratuitously exerted, that it can be continued indefinitely in action, without exhaustion—affirming, in short, that Newton's third law of motion is untrue, and that action and reaction are not equal and opposite.

"The entire science of motion is implicated in this law of action and reaction, which certainly it is not necessary now to defend; but it is not a law of motion only—it is a universal law of Nature. All observations and experience prove, that qualities and quantities of all kinds, of a communicable nature, are, in the very act, lost by one body, in proportion as they are received by the other. Take caloric, for instance, in its other aspect, as simply a heating quality, and only as one body loses temperature is it able to impart it to another. But caloric, doubtless, is in all its aspects a manifestation of force, and unquestionably, as a mechanical agent, of a dynamic force, and

* No. 1691.

therefore is directly amenable to the third law of motion. It is force, in the disguise of molecular action—it is atomic force, not yet converted into mechanical force—it is, in respect to either ponderable, or imponderable matter, a speciality of condition appealing to the feeling of heat for its perception, but susceptible of being changed into another speciality, recognized by a sense of force or power. As mechanical motion—which is the motion of masses in their entirety—can be and, to be made useful, usually is transformed into molecular actions, such as those involved in heat and electricity, and in the rupture of cohesive force, so, through the medium of combustion, these transformations can be reversed, by first liberating molecular forces, and then fixing them in the entire movement of a mass, so as to be rendered available as a mechanical power. Now that peculiar molecular activity which, by some mysterious process, creates the feeling of heat, is not susceptible of an increasing degree of intensity, except when the body is under the restraint of limits to its volume. Remove these—as can be done in an elastic fluid—and any further accession of caloric is no longer apparent under the form of an increasing temperature, or of an increasing degree of repulsive force; but it makes itself visible in an increased range of this force—that is to say, the tension remaining constant, a dynamic force is generated, at the expense of this caloric, as its exciting cause. Thus mechanical force is developed simultaneously with a loss of heat, in entire conformity with the law of action and reaction. The usual phrase is, that heat becomes latent.

"The order and character, then, of these phenomena justify the inference, that what is at one time heat, is at another time modified into mechanical action, they being reciprocally convertible quantities; and, in truth, the change of either into the other is matter of experiment. It follows, then, that sensible caloric is an indication, not of the presence, but of the abeyance of mechanical action—not of its actual, but of its potential existence, and that a working force can appear only as heat disappears. This is an important truth, although veiled somewhat by refinement of conception and nicety of distinction, for which there is a want of an adequate terminology. This truth, so directly in opposition to the idea of caloric operating over and over again, is, however, apt to be overlooked, on account of the general familiarity with a display of heat, simultaneously and in intimate connection with the development of steam force. It thus appears, on a superficial view, that heat operates as a force, and at the same time exists as heat; whereas, heat appertaining even to steam in the cylinder is not really acting, although ever ready to act in the production of elastic force, and ever vanishing in the process. This sensible heat of the working steam is, it is true, its necessary condition whilst maintaining the constant state of its tension; but it is not the efficient cause of force—it is not that which creates repulsion between the particles of steam, otherwise it would at all times be the direct measure of that repulsion, which it is not—it is only an accompanying quantity of caloric,* which when called upon by the permitted expansion of steam to do real work, is absorbed, becomes latent, and disappears. If this were not the true representation of the fact, caloric could be heat and force also, at the same time. This is the popular idea, and science perhaps has not been exempt from it; but if it were so, there would be no impracticability in the project of making it operate over and over again, and the creation of power, in the absolute sense of the words, would be within the capability of man.

"The idea of making heat generate power, and yet lose nothing itself, cannot be sound, as it must ever be ready to produce more power *ad infinitum*—a course of action which, if it were possible to prevail as an ordinance of nature in her general operations, would soon bring the world to an end."

It is true that since failure has showed the fallacy of the idea, the notion of the regeneration of force has been disclaimed for Mr. Ericsson, and it is not now insisted in this new and improved edition of the calori engine; it being stated, "that the object of the regenerator is merely that of economising fuel"—an advantage which it is justly entitled to claim; but that the original theory of the engine was to make caloric "operate over and over again," is evident from the very name given to the peculiar appendage of the engine, "The Regenerator," and from the fact, that in the pages of your Magazine, either for 1833 or 1834, Mr. Ericsson advanced this principle, "that the production of mechanical force is unaccompanied by the loss of heat," except such as arises unavoidably from radiation and the like.

With this retrospect of the past history of the caloric engine before us, it is impossible not to look suspiciously upon it in its new form. The improvement now brought forward is, to obviate the evil which it is said

* It is probable that the more correct physical idea concerning sensible heat is not that in the text, of a superfluous quantity, but of a continual transformation of static into an emission or projectile force. Whatever be the hypothesis, the deduction is the same, and necessarily so, that the same force cannot operate in different modes at one time.

"experience has demonstrated, that in order to obtain a sufficient supply of air, without resorting to a dangerously high temperature, the supply pump must be of such large capacity, that the differential active area becomes too small." In fact, the pump absorbs half the power, and the object is to dispense with it, and this is accomplished by certain curious mechanical contrivances of very complex operation, by which the pump appears to be dismissed. And so it is in form; but it is only by making a cylinder with two pistons perform the double function of working and pumping. No legerdemain sort of contrivance that Mr. Ericsson can devise will enable him to evade the necessity (unless operating continually with the same body of air in closed vessels) of supplying air under a pressure which must be deducted from the total force developed by the engine. But, says Mr. Ericsson, "the power thus applied to compress the supply air is not actually expended, but merely borrowed, for it is so much added to the elastic force of the air by which, when heated, the engine is impelled." That is true, but such is the fact also when an air pump is explicitly as well as implicitly employed. It is perfectly correct, that "the supply of air is not an actual consumption, but a mere transfer of power," and that "the compression which it receives at first from the piston when working in one direction, it returns to the piston when working in the opposite direction;" but that this arises "from the advantages due to the arrangement of the two pistons as specified," is wholly incorrect, for a repayment of the power expended, necessarily belongs to all pumping arrangements whatever. Mr. Ericsson thinks, that by a covert instead of an overt appropriation of the power of the engine to furnish the air supply, he is enabled to claim exclusively for himself, what he appears to imagine is a new discovery peculiar to his arrangements—the borrowed character of the power employed in pumping; but this cannot be conceded to him, although probably it is the popular opinion, that such power, especially as seen in forcing water into the boiler of the steam engine, is absolutely lost. This, however, is not the case, for it imparts an addition to the elastic force of the steam independent of heat. Steam engines, in fact, are as much worked on the differential principle as any air engines are; that is to say, the actual power of the engine, under this point of view, depends on the difference, not, to speak generally, "between the areas of the working and supply pistons" as stated in the description of the present invention, but between the respective cubical contents discharged by each, stroke for stroke, or in a given time, always supposing, however, that the supply is just equal to the demand.

Let us, for the sake of brevity, conceive forces to exist as volumes. Now, when motive power is derived from the forcible expansion of substance in volume, and when by the application of heat of sufficient temperature, taking air as the subject matter, it is doubled in volume, it is clear that the power gained is equal only to one volume, for that only is the range of the dynamic force, the initial space occupied by the air being necessarily excluded. This is the limit which nature herself imposes, and we cannot possibly get any more; and this mode of viewing the subject, by conceiving the difference that arises in the volume of the same body under the influence of heat, gives us in the abstract the normal exemplar of the origin and extent of motive power. But when, in the usual mode of constructing engines, a reservoir of expanded motive matter, be it more or less, is employed, and it becomes necessary to supply fresh volumes of it against the pressure which it exerts, then the gross force developed through the engine is, under the same temperature, equal to two volumes; for every volume forcibly supplied is doubled, and the power mechanically in operation is exerted through a two-fold range.

Now, Mr. Ericsson, seeing that the actual development of force is equal to two volumes, wishes to appropriate them both as a clear gain; but this he cannot do, for, as we have seen, nature gives us only one volume of motive power. The gross power of the engine, therefore, must be necessarily liable to an abatement of one half; and accordingly it is found, that on the supply pump this half is expended —that is to say, the power we borrowed for this purpose is returned again. Thus coming back to the point from which we started, the results are accordant with what I have given as the natural pattern of expansive power; and are precisely the same as are obtained in the more simple mode of constructing an engine, in which the same volume of air is operated upon alternately by contraction and expansion, according to the plan which the late Mr. Brunel and myself proposed some thirty years since, for the construction of a carbonic acid engine. Thus even if we do, in real truth, get rid of the air-pump, according to the mode here alluded to, we gain nothing by it, for the course and constitution of things cannot be coerced by any contrivances of ours. Still less can Mr. Ericsson hope to succeed in cheating nature, by the mere mechanical trickery of making the piston and cylinder do the work of a pump. If, therefore, such is "the improvement with-

out which the power of air engines will always be found insufficient for practical purposes," Mr. Ericsson has himself pronounced the doom of his own inventions.

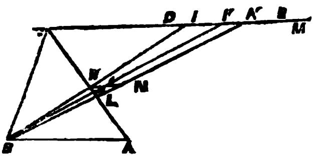
I am, Sir, yours, &c.,
BENJAMIN CHEVERTON.

January 15, 1856.

A PRACTICAL METHOD OF TRISECTING ANGLES.

To the Editor of the Mechanics' Magazine.

SIR,—From the fourth corollary of my former letter* on the trisection of angles, a simple and very accurate practical method of trisecting angles can be derived.†



Let ABC be the angle to be trisected. Take BA=BC; join CA; draw CM parallel to BA and cut CD=BA, DE=BA. Now assume ABK to be $\frac{1}{3}$ ABC. Take a point I on DE; (we take I nearer to D than to E, only to make the figure clearer) join BI, cutting AC in H; then if $\angle ABI > \angle ABK$, $BH > DI$. For, draw HN parallel to IK meeting BK in N, we get (BK cutting CA in L):

$$BH + BL - ID = BH + DK - ID = BH + IK > BH + HN > BN > BL,$$

$$\therefore \quad BH > ID.$$

If we therefore make $DI' = BH$, I' will fall on IM, and since $BH < BL$, because BD would be perpendicular to AC, I' will fall between I and K.

Now, from Δ BLH, we get

$$BH : BL = \sin\left(90° - \frac{ABC}{6}\right) : \sin\left(90° + \frac{ABC}{6} - LBH\right).$$

Or,

$$DI' : DK = \cos\frac{ABC}{6} : \cos\left(\frac{ABC}{6} - LBH\right).$$

This last ratio is (at least as long as ABC is concave) evidently little less than 1, therefore I' will not fall far from K; and since I'K subtends a very small angle at B, $\angle$ I'BA will be very little $> \angle$ ABK.

We can now make the same construction with regard to BI' as with regard to BI, and thus determine a new point I'' which will be nearer to K than I', nearly in the same ratio as I' was nearer to K than I, and so on. It is evident that after one, two, or at the most three such trials, we shall arrive to a position of I dashed which will in reality be no more distinguishable from K. If $\angle$ ABI had been somewhat $<$ ABK, nothing essential would have been changed in the above method.

If $\angle$ ABC is very obtuse, the method becomes somewhat less accurate, but we can trisect the supplement of ABC and subtract the result from 60°.

The approximate position of K, upon which that of I will depend, can be determined *à priori* by considering that as ABC decreases from 180° to 0°, K moves from D to E. For, putting $\angle ABC = a$, $AB = 1$, $BL = x$, we get from Δ ABL:

$$x : 1 = \sin\left(90° - \frac{a}{2}\right) : \sin\left(90° + \frac{a}{6}\right)$$

$$= \cos\frac{a}{2} : \cos\frac{a}{6}$$

$$= 4\cos^3\frac{a}{6} - 3\cos\frac{a}{6} : \cos\frac{a}{6}$$

$$= 4\cos^2\frac{a}{6} - 3 : 1$$

$$\therefore \quad x = 4\cos^2\frac{a}{6} - 3.*$$

(For $x = \frac{1}{3}$, we get: $a = 124°\ 13'\ 44''$.)

From this formula it is easily seen that as a decreases from 540° to 0°, x increases from -3 to $+1$.

For $a = 180°$, $DK = x = 0$
$a = 135°$, $DK = x = 0·41$
$a = 90°$, $DK = x = 0·73$
$a = 60°$, $DK = x = 0·88$
$a = 45°$, $DK = x = 0·93$
$a = 30°$, $DK = x = 0·97$

The value of x can also be found approximatively from the figure itself by taking *à priori* an approximate value of $\frac{1}{3}$ ABC, or in fact by drawing BI so that DI may be nearly equal to BH.

---

* *Mech. Mag.*, vol. lxiii., p. 589, No. 1689.

† I may take this opportunity of adding the following to that corollary:

If, in the figure relating to it, we draw a perpendicular BP on AK, AP shall be an arithmetic mean between AB and AH. For, Δ ABP is similar to Δ KGD, and $AB = \frac{1}{2}GK$;

$$\therefore AP = \tfrac{1}{2}DK = \tfrac{1}{2}(AB + AH).$$

* Hence we get:

$$\cos\frac{a}{6} = \tfrac{1}{2}\sqrt{x+3}.$$

This value can be constructed geometrically, and can be applied to solving geometrically the problem:—*To describe an isosceles triangle, having given its sides and the part of the line trisecting its vertical angle, contained between the vertex and the base.* The simplest construction, however, is derived from cor. I of my former letter. For, if in the figure relating to it, AD, DC be given, the three sides of Δ ADE are known, and the construction of ADB is easily achieved. If AD, AC had been given, Δ ACE would have been known, and hence Δ ADB. But if AB, AC, or AB, CD, or AC, CD are given, Δ ADB cannot be constructed geometrically.

As an example, take $\angle ABC = 60^\circ$, $\angle ABI = 21^\circ$. Put $\angle ABI' = \phi$, we get:

From $\triangle ABH$:

$$BH : 1 = \sin 60^\circ : \sin 81^\circ.$$

From $\triangle BCI'$:

$$CI' : 1 = \sin(60^\circ - \phi) : \sin \phi;$$

$$\text{or } 1 + \frac{\sin 60^\circ}{\sin 81^\circ} : 1 = \sin 60^\circ \cot\phi - \cos 60^\circ : 1$$

$$\therefore \cot\phi = \frac{1 + \frac{\sqrt{3}}{2\sin 81^\circ} + \frac{1}{2}}{\frac{1}{2}\sqrt{3}} = \frac{1}{\sin 81^\circ} + \sqrt{3}.$$

Finishing the calculation, we find:

$$\phi = 20^\circ\, 1'\, 11''\cdot 53.$$

The error is therefore diminished from 1° to $1'\, 11''\cdot 53$, or nearly in the ratio $50 : 1$. If we now find the point I'', as shown above, the error will be reduced to nearly $\frac{1'\, 11''\cdot 53}{50}$, or $1''\cdot 4$, a value altogether inappreciable for ordinary purposes.

This method of trisecting angles will, I think, be found the most practical, when great accuracy is required, especially by taking BA large.

I am, Sir, yours, &c.,

C. J. Recordon.

P.S.—If we admit with "Cantab" that a cycloid can be accurately described, we have the means not only of trisecting an angle, but also of squaring a circle, and of finding any part $\frac{m}{n}$ of an angle, $\frac{m}{n}$ being any ratio into which a straight line can be geometrically divided. C. J. R.

Cambridge, Dec. 22, 1855.

THE DECIMAL COINAGE QUESTION.

[The following is an extract from a letter recently addressed to Mr. S. A. Good, master of the Royal Dockyard school, Pembroke, to Robertson Gladstone, Esq., president of the Liverpool Financial Reform Association.]

The more closely I examine the matter, the more I convince myself that it (the millesimal division of the pound) is purely a question of convenience to the banking and commercial interests, and that people generally can derive little or no benefit from the proposed change. On the contrary, apprehensions are justifiable that very great injury to the poor would be the consequence of any such system becoming the law of the land. * * *

Mr. Kirkham, in his evidence before the Parliamentary committee of 1853, states that he sold in one day, to 230 customers, 400 articles averaging 2½d. each, of which as many as 315 did not exceed 3d. each. Now, the nearest adjustment he could make in "mils" (11 for 2½d.) would leave him a gainer of 4s. 8d., or 4 3-5 per cent., at of course the loss of his poor customers, unless his ardour in the cause of decimalism induced him to sacrifice 4 per cent., or 3s. 4d., on his day's sales. The following items of a Saturday night's expenditure in a grocer's shop, by the wife of a mechanic, will serve to illustrate the *pecuniary* effect on a very large proportion of the population of substituting the "mil" for the penny as a standard of value:

	Pence.	would be	Mils.
1 oz. tea	3	charged	13
½ lb. sugar	2½	„	11
2 oz. coffee	2	„	9
2 oz. arrowroot ..	3	„	13
1 lb. flour	2¾	„	12
1 lb. oatmeal	1½	„	7
1 lb. rice........	2½	„	11
½ pint peas......	1¼	„	6
¼ lb. butter......	3	„	13
¼ lb. lard........	2¼	„	10
½ lb. cheese......	3½	„	15
½ lb. soap	2½	„	11
¼ lb. starch......	2	„	9
1 oz. blue	1½	„	7
1 oz. pepper	1¼	„	6
1 oz. mustard....	1½	„	7
1 packet blacklead	1½	„	7
1 lb soda........	1	„	5
½ pint vinegar....	1½	„	7
	3s. 4d.		179=*3s. 7d.*

In this example, the alteration amounts to 7 2-5 per cent. against the purchaser, and on the very moderate assumption that in the United Kingdom there are 4,000,000 families who spend each on an average but 6s. 8d. a week on similarly priced articles, the substitution of "mils" for pence would make a difference of not less than £100,000 weekly, or nearly *five millions and a quarter annually!* I leave it to the advocates of the new system to calculate the time that would elapse before "things would find their proper level." The experiment, in the meanwhile, would, under the most favourable circumstances imaginable, prove to be an exceedingly costly one to those least able to bear the expense.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Wilkins, W. C. *An improvement in lamps.* Patent dated June 21, 1855. (No. 1419.)

This invention consists in fitting inside the wick or flame in an Argand burner a silvered or other suitable reflector; in protecting the reflector by a glass chimney placed outside of the reflector and inside of the flame; and in keeping the reflector comparatively cool by allowing an upward

current of atmospheric air to pass both inside thereof and outside between it and the glass chimney. The reflecting surface will be kept from being tarnished by the glass chimney, which prevents smoke and the products of combustion from coming in contact with it, while the streams of cool air passing up inside and outside of it will prevent its becoming so heated as to destroy its reflecting surface.

BEN'JAMIN, J. *Improvements in apparatus for the manufacture of gas.* (A communication.) Patent dated June 21, 1855. (No. 1423.)

Claims.—1. Constructing a retort with three compartments communicating together so as to form one continuous passage, and having a lid or lids for charging and discharging, and a pipe adapted for the introduction of water or steam. 2. The combination of a syphon pipe with a retort constructed as above described.

BOUGEREAU, T. *Improvements in apparatus for roasting coffee.* Patent dated June 21, 1855. (No. 1424.)

This invention consists in using a spherical in place of a cylindrical apparatus, and in giving to such spherical apparatus rotatory motions about both a horizontal and a vertical axis simultaneously.

KEEVIL, R. *Improvement in vessels used in the manufacture of cheese.* Patent dated June 21, 1855. (No. 1425.)

This invention consists in making such vessels with fixed strainers at the side or bottom, or both.

BASEBE, W. *Improvements in the manufacture of paper.* Patent dated June 21, 1855. (No. 1426.)

This invention consists in introducing perfumes or scents into the pulp from which paper is made; or in immersing the paper, by preference in the green state, in liquid perfumes or scents.

YOUNG, L. *An improvement in the construction of gas-regulators.* Patent dated June 21, 1855. (No. 1428.)

The object of this invention is to facilitate the dip of the floating drum of a gas-regulator into the mercurial joint. In order to effect this, a counterpoise to the resistance which the mercury offers to the descending drum is provided, by making the rod or lever which connects the floating drum with the regulating valve hollow, and inserting therein mercury or its equivalent.

BELLFORD, A. E. L. *Improvements in steam engines for pumping and other purposes, part of which improvements is also applicable to pumps.* (A communication.) Patent dated June 21, 1855. (No. 1430.)

This invention primarily consists in leading the eduction pipe of a steam engine into the suction pipe of a force or lift pump, whereby the condensation of the steam is effected, and a vacuum produced without a separate condenser and air pump.

TEALL, W. *An improved method of treating and working soapy or greasy waters, in order to obtain the greasy substances therefrom.* Patent dated June 22, 1855. (No. 1431.)

This invention consists—1. In the treatment of soapy or fatty waters by artificial heat as described. 2. In subjecting soapy or fatty waters to currents of atmospheric air, preparatory to the decomposition and separation of the soapy or fatty matters.

CHASE, O. R. *An improved machine for making lozenges, and for other purposes.* Patent dated June 22, 1855. (No. 1432.)

This machine is merely an improvement on that described in the specification of a patent granted to the inventor the 21st of June, 1854.

SIMON, S. E. G. *The use of a new material in the manufacture of paper.* Patent dated June 22, 1855. (No. 1433.)

This invention consists in the substitution wholly or in part of the plants of the different species of the family *sparganium*, particularly that known as the *sparganium erectum*, or *sparganium ramosum*, for rags in the manufacture of paper.

WHITE, S. *Improvements in washing, cleansing, and drying grain.* Patent dated June 22, 1855. (No. 1434.)

Claims.—1. The employment for the purpose of washing and cleansing grain of an apparatus consisting of an Archimedean screw furnished with agitators between its threads, and placed in a perforated plate or trough contained within a case or tank supplied with water or other fluid. 2. The employment in a kiln for drying grain and similar purposes of a shaft with arms, and rakes, and stirrers fixed thereon in inclined directions, or a series of such arms carrying rakes, in such manner that the materials to be dried may be well stirred, and moved towards the point at which they are to be delivered from the kiln.

BELLFORD, A. E. L. *Improvements in screw-fastenings.* (A communication.) Patent dated June 22, 1855. (No. 1435.)

This invention mainly consists in constructing the head of a screw bolt of fixed wedges or inclined pieces and loose expanding pieces, whereby the screwing up of the nut causes the said head to expand for the purpose of making it fit tightly in a suitable hole in which it is placed.

BELLFORD, A. E. L. *Improvements in pulverizing quartz, mineral, and other hard substances.* (A communication.) Patent dated June 22, 1855. (No. 1437.)

This invention consists in combining with a rotating vessel having a rim against which

the substance to be crushed is distributed and held by centrifugal force, one or more wheels with rounded or bevelled treads turning on axes arranged radially, or nearly so, to the axis of the pan or sheil, and whose planes of motion are tangential to a circle of a less diameter than the rim of the pan.

ALLEYNE, J. G. N., and H. STRAFFORD. *Improvements in railway brakes.* Patent dated June 22, 1855. (No. 1438.)

Claims.—1. Constructing railway brakes in such manner that the brake - lever is secured by means of a bar or paul placed above it, and turning upon a pin or centre. 2. Constructing railway brakes with a bar or paul turning upon a pin or centre and placed above the brake lever, which passes through an eye or loop in the bar or paul, and is secured by the aforesaid bar or paul entering notches or teeth on the brake lever, or by means of a pin entering holes in that lever.

PENRICE, H. N. *Improvements in machinery for propelling vessels.* Patent dated June 22, 1855. (No. 1439.)

In this invention (which resembles that of which Captain Penrice exhibited a model in the Great Exhibition of 1851) propellers are fixed at or near the ends of bars which at their opposite ends are connected to cranks, either by connecting rods or directly to the crank pins. Each of the propeller bars is supported by a guide which moves on an axis; and in order to sustain the rods the guides are arranged to give them support for as large a portion of their length as conveniently may be. In order to govern the motion of the propellers, eccentrics are used, which, by intermediate rods, actuate the guides in such manner as to cause the propellers to descend into, push against, and rise from the water successively.

SOREL, S. T. M. *A machine for applying adhesive matters on stuffs, and also for applying on the said matters other substances or stuffs.* Patent dated June 23, 1855. (No. 1440.)

The essential principle of this machine consists in the employment of a sheet of vulcanized caoutchouc, or other analogous substance capable of supporting a high temperature and resisting the action of the solvents of caoutchouc and gutta percha, and serving to spread compositions in regular coats upon the tissues.

WALKER, T. *Improvements in projectiles for ordnance and other fire-arms.* Patent dated June 23, 1855. (No. 1441.)

These improvements relate chiefly to the forming of projectiles which are of a cylindrical figure, or partly so, with grooves or flutes slightly inclined across their cylindrical surface, for the purpose of giving to them a tendency to rotate.

MOWBRAY, F. W. *Improvements in looms for weaving.* Patent dated June 23, 1855. (No. 1442.)

Claims.—1. Arranging and combining apparatus for operating the adjoining selvage threads of breadths of fabric woven side by side to be separated by cutting, whereby such selvage threads may have a continuous twist given to them in one direction. 2. Arranging and combining certain parts for operating rotatory shuttle boxes as described. 3. So arranging and combining apparatus for operating rotatory shuttle boxes, that such may be capable of moving a distance equal to two compartments of the series; also, another method of operating rotatory shuttle boxes. 4. A mode of arranging and combining parts for taking back the picker, as described. 5. Certain arrangements and combination of parts for stopping the loom when the shuttle does not properly land in its box.

PEARCE, W. *Improvements in machinery for manufacturing certain articles of pottery, such as pipes, tiles, hollow bricks, and other like articles.* Patent dated June 23, 1855. (No. 1443.)

Claim.—Constructing machines for moulding articles of clay in which the core of the die or mould is supported by a central shaft.

SILBERMANN, I. J. *A new system of manufacturing globes and other printed plane or curve surfaces.* Patent dated June 23, 1855. (No. 1445.)

This invention relates to a means of printing by moulding, on all sorts of plane or curve surfaces, and consists—1. In using curve or plane moulds, formed of such substances as can be etched, engraved, or embossed. 2. In inking the engraved surface with common printer's ink for obtaining a plane print, or with indelible inks, proof against heat, when the printed surfaces are to be baked or moulded in the heated state. 3. In moulding or casting the matters to be printed on the engraved inked surfaces.

BELLFORD, A. E. L. *Improvements in the manufacture of bats for felting, and in machinery for manufacturing the same.* (A communication.) Patent dated June 23, 1855. (No. 1446.)

This invention consists mainly in preparing the web for felt fabrics by the introduction of layers of flock between or upon the layers of wool, by preparing the flock in a separate machine and introducing it immediately from that machine on to the web of wool while it is passing from the carding machine.

YOUNG, J. *Improvements in, and applicable to, harrows.* Patent dated June 25, 1855. (No. 1448.)

This invention consists in adapting and applying to the teeth of "grubber harrows"

tongues or guides of such form as to be capable of clearing the teeth as they pass through the land, by raising up and throwing off obstructions.

PAGE, J. *Improvements in moulding or shaping metals.* Patent dated June 25, 1855. (No. 1450.)

In this invention in casting such articles as pipes, core-bars, "capable of expanding and collapsing in diametrical dimensions," are employed. These core-bars are each composed of longitudinal pieces of segmental metal plates, so combined as to be capable of forming bars of various diameters, and are adjusted, by means of a central spindle, carrying on its projecting end a metal disc furnished with suitable inclined pieces.

SMITH, S. *Improvements in apparatus for insuring the correct action of the safety-valves of steam boilers, and for regulating the action of dampers of steam boilers.* Patent dated June 25, 1855. (No. 1451.)

In carrying out this invention the steam in the boiler presses on one surface of a column of fluid (by preference water) in a bent tube which is fixed at one end to the boiler or steam chest, or a pipe connected therewith. The other end of the bent pipe is attached to a pressure gauge consisting of a hollow chamber which is divided by a flexible partition or diaphragm, by preference of thin steel, above which a stem or rod is placed, the upper end of which, when it is raised beyond a certain point, acts on the lever of the safety valve and lifts it, and in like manner, either by a cord or wire, or other interposed instrument, the pressure gauge gives motion to the damper, so as to close it more and more as the pressure of the steam in the boiler acts more on the partition or diaphragm of the pressure gauge, which diaphragm or partition is resisted externally by a coiled spring.

POOLE, M. *An improvement in sculpturing surfaces of marble and stone.* (A communication.) Patent dated June 25, 1855. (No. 1452.)

This invention consists in rolling or rocking an engraved or embossed metallic surface in contact with a surface of marble or wood, sand or other suitable cutting material being interposed between.

BELLFORD, A. E. L. *Certain improvements in rotary blowing-machines, which are also applicable to rotary pumps, to rotary engines to be driven by steam or other fluids, and to meters for measuring the flow of fluid bodies.* (A communication.) Patent dated June 26, 1855. (No. 1454.)

This invention mainly consists in the employment of a drum arranged so that it may be rotated upon its axis, and having slots or openings through its periphery for fans, buckets, or sliding pistons, in combination with an arrangement of the fans, buckets, or pistons upon an independent axis inside the drum, but eccentric to the axis thereof, so that as the drum is revolved, the fans, buckets, or sliding pistons are projected beyond the surface of the drum at one side to fill the case surrounding it, and at the other side are drawn within the drum.

SHARP, T. B., and A. YORSTON. *Improvements in the arrangement and construction of furnaces or fireplaces.* Patent dated June 26, 1855. (No. 1455.)

This invention consists in the application of a curved midfeather to the furnace or fire-place of a locomotive engine boiler for dividing the space above the fire grate into two compartments.

LEISS, F., and C. SCHNEIDER. *Manufacturing mica letters, numerals, shopsigns, figures, arms, devices, and ornaments.* Patent dated June 26, 1855. (No. 1456.)

In carrying out this invention the material, after being cleaned, is slit to the required thinness with instruments of glass, horn, ivory, or steel, and then drawn on and coloured; or sometimes it is coloured and hardened in its raw state.

RONALD, J. *Certain improvements in machinery for dressing manilla and other hemps and flax.* Patent dated June 26, 1855. (No 1457.)

This machine described by the inventor consists of two principal parts. The first part contains a holder (for retaining the hemp or flax) consisting of an upper and lower part, the upper part being moveable, and capable of being pressed down by a screw. This holder is moveable in slides, and is actuated by means of bands passing around a roller which is driven by means of a worm and worm wheel, and connected by bevel gearing to the main driving shaft. The worm wheel may be thrown out of gear when required by means of a catch box. The second part of the machine consists of a series of "hackles" for dressing the hemp or flax.

POOLE, M. *An improvement in the manufacture of printing rollers or cylinders.* (A communication.) Patent dated June 26, 1855. (No. 1458.)

In this invention iron rollers or cylinders of nearly the required diameters are employed, and on to their surfaces coatings of copper are deposited by electric currents.

BONNET, B. *Improvements in weaving.* Patent dated June 26, 1855. (No. 1459.)

Instead of the weights which are attached to the barrels or healds through which warp threads pass in some looms, the inventor employs India-rubber springs.

DEREGNIAUX, F. V. *Improvements in the construction of spinning machinery.* Patent dated June 26, 1855. (No. 1460.)

This invention consists in imparting pressure to the pressing rollers of spinning frames by means of presser bars "acting in straight, or right, or parallel lines, or in a direct line to the centre of the rollers, in contradistinction to curved lines as heretofore."

DISTIN, H. J. *Improvements in the means of rendering the ordinary field or regulation bugle chromatic.* Patent dated June 26, 1855. (No. 1465.)

In order to render an ordinary field or regulation bugle chromatic, Mr. Distin inserts any suitable chromatic arrangement in the neck of the bugle.

SWINBURNE, T. *Improvements in machinery for applying and obtaining motive power applicable, but not exclusively so, in the propulsion of vessels and railway trains.* Patent dated June 27, 1855. (No. 1467.)

This invention mainly consists in a number of combinations of racks and pinions, levers and clutches, &c., intended to supply the place of the ordinary crank.

BUHLER, D. D. *Certain improvements in the construction of fencings.* Patent dated June 27, 1855. (No. 1468.)

This invention comprises arrangements for bending wires or rods for fencings into various forms. One arrangement consists of two flat surfaces, one of which contains indentations, and the other corresponding projections; and another consists of two rollers, upon the circumference of one of which are grooves or indentations according to the design required, and on the other corresponding projections. Between these rollers the wire or iron band is fed.

MARGUERITTE, L. J. F. *Improvements in the manufacture of glass and crystal.* Patent dated June 27, 1855. (No. 1470.)

This invention consists in "calcining chlorides of sodium and of potassium with a silicate, the elements of which are capable of forming a volatile chloride, and by using any sort of clay."

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GERNON. J. *Improvements in the manufacture of articles of clay.* (A communication.) Application dated June 20, 1855. (No. 1408.)

In this invention the clay articles, instead of being burnt, are inserted into a still with coal tar, and the coal tar is distilled to obtain products therefrom in the ordinary manner. When the distillation is complete the pitch is run out, and the hardened articles are removed from the still.

GERNON, J. *Improvements in the manufacture of plaster of Paris and cement.* (A communication.) Application dated June 20, 1855. (No. 1409.)

In this invention the stones are hammered and rolled to powder, and then placed in a revolving retort in a furnace, in the interior of which retort is a screw surface which, as the retort revolves, causes the powder to pass from one end of it to the other; on coming out of the retort the coarse powder is ground to an impalpable powder, and again roasted in a revolving retort.

MARTINOI, G. M. DE, and J. F. O. DE LARA. *The employment of a new material in the manufacture of paper.* Application dated June 20, 1855. (No. 1411.)

The "new material" mentioned in the title is seaweed!

RIOUX, P. F., and L. DE PARIENTE. *Improvements in the fixing of metallic ornaments upon paper, flock, leather, cotton, silk, or any other fabrics to which such ornaments may be applicable.* (A communication.) Application dated June 21, 1855. (No. 1420.)

In this invention blocks, cylinders, or dies are heated and pressed upon the fabric, giving it a slight impression of the design. "We then place," say the inventors, "upon the place where the design has been so printed, dry albumen, gum lac, and rosin, each in powder, spirit varnish, or copal varnish, or any other suitable body that will cause the metallic surface to adhere. After any of these preparations are carefully sifted over or painted on with a brush upon the surface of the part impressed, we take the metallic leaf and place it over the powder or varnish, so put on, and dab it down with a piece of cotton, wool, or cloth." The blocks, cylinders, or dies are then pressed over the surfaces in the same places as before.

SHELLEY, M. *Improvements in cooking utensils.* Application dated June 21, 1855. (No. 1421.)

These improvements consist in the application of tubes to the lower parts of saucepans, tea-kettles, &c., which tubes depend or project from the vessels into or near the lighted fuel.

BIRCH, J. R. *An improved boat-plug or self-acting valve.* Application dated June 21, 1855. (No. 1422.)

This invention consists in adapting to the bottom of a ship's boat a self-acting hinged valve opening outwards in lieu of the detached plug hitherto employed in ships' boats.

GREEN, C. E. *Improvements in huts, tents, and camp-hospitals.* Application dated June 21, 1855. (No. 1427.)

This invention consists—1. In the construction of tents or huts in several parts which are to be held together by hinges or otherwise, so that they can be folded up

in one or more packages for portability. 2. In making tents or huts of framework, so arranged as to allow an internal and external covering, thereby leaving space for a current of hot or cold air as may be required between them.

PIERCE, T. C. W. *Certain improvements in machinery or apparatus for finishing yarns or threads manufactured from cotton, silk, flax, or other textile materials.* Application dated June 21, 1855. (No. 1429.)

The inventor causes the yarn or thread to pass over a series of metal rollers suitably arranged and heated by means of metallic heaters placed inside them.

BELLFORD, A. E. L. *Improvements in breech-loading fire-arms and cartridges relating thereto.* (A communication.) Application dated June 22, 1855. (No. 1436.)

The object of these improvements is to simplify the construction of needle-guns, and to avoid the inconveniences they are subject to in practice, such as the breaking and bending of the needle; also to construct cartridges or projectiles which may be fired in a direct line with the needle.

WHISH, G. *Improvements in oscillating steam-engines.* Application dated June 23, 1855. (No. 1444.)

This invention consists in dispensing with the ordinary valves of an oscillating engine, and working it by means of a single slide-valve worked by hand.

GEDGE, J. *Improvements in apparatus or mechanism for measuring liquids.* (A communication.) Application dated June 25, 1855. (No. 1447.)

"I propose," says the patentee, "to receive water or other liquid into an upper cylinder by means of a service pipe. This cylinder is to be furnished interiorly with a valve, which, opening, allows the liquid to descend into a receiver from which it is distributed to other parts of the apparatus by means of a pipe, which pipe will also be attached to a cylinder or float mounted upon a rod and will serve to open and shut the valves aforesaid, and regulate the supply into the upper cylinder, indicating by an index marked thereon the presence of the liquid, which is then to be received into a gauge of triangular form, furnished at the axis with a counter weight of equal weight to the quantity of liquid the gauge is to distribute at each operation of service, which operations are to be indicated by numbers marked on the outer periphery of a wheel."

HARRIS, J. *A machine and apparatus for crushing and pulverising metals, metallic ores, metalliferous matters or substances whatever, and for obtaining, washing, dividing, amalgamating metals and other matters or substances contained therein.* (A communication.) Application dated June 25, 1855. (No. 1449.)

The crushing machine, described by the patentee, is made of cast and wrought iron, so that parts of it can be replaced. The apparatus for obtaining, washing, dividing and amalgamating metals, &c., is made of glass, india rubber, gutta percha, iron, copper, zinc, or brass, or any of these combined; at the top of it is a chamber, at the bottom of which is a ball worked by an eccentric. Attached to this apparatus is a vessel to hold mercury for purposes of amalgamation.

PARSONS, P. M. *Certain improvements in moulds for casting metals.* Application dated June 25, 1855. (No. 1453.)

The inventor makes the moulds for casting metals of clay of a sufficiently refractory nature, or of compounds of clay with other siliceous materials, such as sand, old crucibles, firebricks, &c., reduced to powder, and with blacklead, charcoal, or sawdust, baked or burnt until sufficiently hard to bear molten metal without injury, so that a number of castings may be made from the same mould.

POUILLET, C. M. *Certain improvements in railways.* Application dated June 26, 1855. (No. 1461.)

A description of this invention will be given hereafter.

BUCKNALL, J. J. *Improvements in the manufacture of hats and caps, and the employment of certain tools for producing the same.* Application dated June 26, 1855. (No. 1462.)

This invention consists in perforating with numerous holes the entire cylindrical part, as well as the crown of the body of hats, &c., or as large portions of such parts as may be found convenient; and in employing certain tools for effecting the perforation.

RAUX, F., and L. PORET. *Improvements in the preparation of artificial mineral waters.* Application dated June 26, 1855. (No. 1463.)

The inventors employ an apparatus which consists of a vessel upon the top of which is fixed a cover. In the centre of this cover a hole is made to admit a spindle, which has attached to it several arms or blades of a suitable shape for the purpose of agitating the liquid.

CLEMENTS, J. M. *Certain improvements in pockets with spring-lock fastening, applicable to male and female attire, as also as a fastening for bags, reticules, purses, or similar articles.* Application dated June 26, 1855. (No. 1464.)

This invention chiefly consists in providing a pocket with a frame fastened by a spring-catch, and in introducing into the woven fabric of which such pocket may be made threads of wire.

PROVISIONAL PROTECTIONS.

Dated November 16, 1855.

2584. William Cooke, of Frederick-street, Gray's-inn-road, Middlesex, civil engineer. An improved apparatus for cleaning knives and other cutlery.

Dated November 21, 1855.

2624. William Cooke, of Frederick-street, Gray's-inn-road, Middlesex, civil engineer. Improvements in gas and solar light reflectors.

Dated November 29, 1855.

2698. George North, of Lewisham-road, Greenwich, Kent, coach builder, &c. An improved portable apparatus for supporting and folding heads, tilts, coverings, and awnings of wheel-carriages, marine vessels, goods, and ways.

Dated December 10, 1855.

2780. John Hall, the younger, of Mount Pleasant, Walmersley, near Bury, Lancaster, spinner and manufacturer. Improvements in Jacquard looms.

Dated December 12, 1855.

2807. Isaac Beardsell, of Huddersfield, York, manufacturer. Improvements in the finishing of mohair cloths and other textile fabrics, and in the machinery employed for that purpose.

2809. Robert Midgley, of Salterlee Mill, Halifax, York, and George Collier, of Halifax. Improvements in preparing worsted, mohair, alpaca, cotton, and other yarns.

2811. Richard Holben, of Barton, Cambridgeshire. Improvements in apparatus for chapping barley.

Dated December 13, 1855.

2813. John Roberts, of Falmouth, builder. Improvements in machinery for moulding bricks and tiles.

2815. Alphonse Louis Poitevin, civil engineer, of Paris, French empire. Improved photographic printing.

2817. James Murdoch, of Staple-Inn, Middlesex. A process for separating the oleine from the stearine of fatty and oleaginous bodies, and for the extraction of oil from oleaginous grains and from olives. A communication.

2819. John Little, of Glasgow, Lanark, ironmonger. Improvements in heating and cooking apparatus.

2821. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in apparatus for containing compressed air or gases, and in the application of the same to the obtainment of motive power. A communication from the Company "John Cockerill," of Seraing, Belgium.

Dated December 14, 1855.

2823. John Walter Friend, of Freemantle, Southampton, watch and clock-maker. An improved registering log and deep sea lead.

2825. Alfred Krupp, of Essen, Prussia, cast steel manufacturer. Improvements in railway and other wheels, and in the method of, and machinery for, manufacturing the same.

2827. Charles John Todd and Robert Pinkney, of the firm Blackwood and Co., ink manufacturers, Long-acre, Middlesex. A balance pen.

2829. Peter Haworth, of Manchester, Lancaster, patent leather manufacturer, and Alexander Forrest, of Birmingham, Warwick, gentleman. An improvement in the manufacture of belts, bands, braces, and other similar articles of wearing apparel.

Dated December 15, 1855.

2831. Leonard Clayton, of Unsworth, Lancaster, manufacturer. Improvements in machinery for dressing yarn.

2833. John Aspinall, of Limehouse, Middlesex, civil engineer. Improvements in machinery for curing sugar and extracting moisture therefrom, parts of which are applicable to separating liquids and moisture from substances containing the same.

2837. Agnes Wallace, of Nether-place Bleach Works, Renfrew, and John Wallace, of the same place, bleachers. Improvements in bleaching, washing, or cleansing textile fabrics and materials.

2839. William Clay, of Liverpool, Lancaster, iron manufacturer. Improvements in the manufacture of bar iron.

2841. William Clay, of Liverpool, Lancaster, iron manufacturer. Improvements in the manufacture of iron and steel.

Dated December 17, 1855.

2843. Samuel Fletcher Cottam, of Manchester, machinist. Certain improvements in mules for spinning cotton and other fibrous materials.

2845. Charles Bracegirdle, of Congleton, Chester, silk manufacturer. Improvements in the manufacture of bolting cloths employed in dressing flour.

2847. John Lobb Jeffree, of Blackwall, Middlesex, engineer. Improvements in or additions to furnaces.

2849. Frederick William East, of Bermondsey-street, Middlesex. Improvements in waterproofing and enamelling textile and other fabrics, in imitation of and to be used in lieu of leather, and for other similar purposes.

2851. William Sangster, of Cheapside, London. Improvements in the manufacture of stays and corsets.

2853. William Hemsley, of Melbourne, Derby. An improvement in the manufacture of elastic pile fabrics.

2855. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in ships' tillers. A communication from L. P. F. David, of Havre, France, chain manufacturer.

2857. William Wilkinson, of Nottingham, frame-work-knitter. Improvements in machinery employed in the manufacture of looped fabrics.

Dated December 18, 1855.

2859. Alexandre Tolhausen, of Duke-street, Adelphi, Middlesex, sworn interpreter at the imperial court of Paris. An improved harvesting machine. A communication from D. C. Henderson, and A. H. Caryl, of Sandusky, Ohio, United States.

2861. Christopher Nickels, of Albany-road, Surrey, and James Hobson, of Leicester. Improvements in the manufacture of pile fabrics.

2863. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved mode of manufacturing wrought iron cannon. A communication.

2865. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in washing-machines. A communication.

2867. Frederick Robert Augustus Glover, of Bury-street, Saint James, Middlesex, master of arts. An improved instrument or apparatus for taking angles and measuring lines, surfaces, and solids, and ascertaining the variation of the needle.

Dated December 19, 1855.

2869. Joseph Cartwright, of Hyde, Chester, millwright and engineer. Improvements in taps or valves.

2871. Richard Ruston, of Birmingham, Warwick, coachmaker. Improvements in the construction of anchors, and appendages to be used therewith.

2873. Josiah Sanders, of Bristol, Somerset, truss-maker. Improvements in trusses for supporting parts of the human body.

2875. George Harvey, of Charlotte-street, Portland-place, Middlesex. Improvements in portfolios.

Dated December 20, 1855.

2877. Robert William Sievier, of Upper Holloway, Middlesex. Improvements in guns and pieces of ordnance, and the projectiles thrown from them for the purposes of war.

2879. James Fleming, junior, of Newlands-fields, Renfrew, bleacher. Improvements in bleaching, washing, cleansing, and preparing textile fabrics and materials.

2881. Evan Evans, of South Wales. Improvements in combining and fixing railway-bars.

2883. Philip Antrobus, of Chepstow, Monmouth. Improvements in preserving and packing flour.

2885. Alexander Charles Louis Devaux, of King William-street, London, merchant. Improved machinery for crushing and grinding vegetable and other substances.

Dated December 21, 1855.

2887. David Dunne Kyle, of Albany-street, Regent's-park, Middlesex. A method of communicating motion.

2889. John Watson, of Glasgow, Lanark, North Britain, manufacturer. Improvements in the manufacture or production of articles of ladies' dress.

2891. Bernard Hughes, of Rochester, New York, United States. A mode of mingling the vapour of bi-sulphuret of carbon and steam, and applying them as a motive power.

2893. Charles James Appleton, of Manchester, Lancaster. Improvements in machinery or apparatus for knitting. A communication from J. Pepper, of Franklin, United States.

2895. Edward Tyer, of Cornhill, London, electrical engineer. Improvements in telegraphing or communicating by means of electricity.

2897. Charles Glover, of Lincoln, carpenter and joiner. Removing snow from a line of railways.

Dated December 29, 1855.

2942. Lewis Harrop, cotton spinner, Samuel Barlow, overlooker, and Alexander Boyd, machinemaker, of Oldham, Lancaster. Certain improvements in self-acting mules for spinning and doubling cotton and other fibrous materials.

2944. Alfred Ford, of Park-lodge, New-road, Hammersmith, Middlesex, surgeon. Preparing and dissolving in naphtha or oil of turpentine vulcanized India-rubber, for the purpose of waterproofing, and all or any of the other purposes for which the same, not so prepared and dissolved, is now applicable.

2946. William Lange, of Tachbrook-street, Middlesex, merchant. Improvements in biscuit-ovens. A communication from J. Lange, of Altona, near Hamburg.

2948. George Royds Birch, of Paddington. A form and folding desk combined, adapted for the use of schools.

2950. Thomas Holmes, of Hull. An improvement in the manufacture of driving straps or bands for machinery.

Dated December 31, 1855.

2954. Joseph Salter, of Manchester, gentleman. Improvements in apparatus for promoting the draught in chimneys, and for ventilating apartments.

2956. Archibald Turner, of Leicester, elastic web manufacturer. Improvements in the manufacture of looped fabrics.

2958. George Hallen Cottam, of St. Pancras Iron Works, Old Pancras-road, engineer. Improvements in applying detonating or exploding signals on the rails of railways.

Dated January 1, 1856.

2. Ferdinand Swift, of Brompton-row, Brompton, Middlesex, gentleman. Improvements in carriage-wheels and axles, and in vehicles for common roads.

4. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. A novel system of propulsion, applicable to land and water. A communication from F. Garnier, merchant, of Clermont Ferrand, France.

6. Alexander Cochrane, of Eaton-terrace, St. John's-wood, Middlesex. Improvements in collecting and distributing water and alluvial deposits contained in sewage and other water.

Dated January 2, 1856.

10. Richard Albert Tilghman, of Philadelphia, United States. Improvements in the manufacture of iron.

12. Harvey Lewis Sellers, of Cincinnati, Ohio, United States, doctor of medicine, and John Littler Talbott, of the same place, gentleman. Improved apparatus for measuring and weighing grain, seeds, and other substances. A communication.

Dated January 3, 1856.

14. Frederick Haines, of Lime-street, London. The deadening of the sound and the prevention of vibration and concussion in connection with machinery, gun, and mortar boats, and general ordnance, and other purposes.

16. George Williams, of Cannon-street East, Middlesex, plumber. Improvements in the construction of waterclosets for ships.

18. William Alfred Distin, of Cranbourne-street, Leicester-square, Middlesex. Improvements in pipes for smoking.

22. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in apparatus or means for facilitating the performance of church and other music on organs, harmoniums, pianos, and other similar keyed musical instruments. A communication from F. Guichené.

24. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in breech-loading fire-arms. A communication from C. A. Friedrich, of Stettin, Switzerland.

26. James Frederick Lackersteen, of Young-street, Kensington-square. Improvements in the prevention of collisions on railways.

28. Charles Marsden, of Kingsland-road, Middlesex, ventilating engineer. Improvements in the ventilation of sewers, tunnels, mines, and other confined places.

Dated January 4, 1856.

30. Henry Bach, of Sheffield, York, hosier. Improvements in the application of glass to decorative purposes.

32. William Simmons, of Oldham, Lancaster, hat manufacturer. An improved hat body.

34. Thomas Hudson, of South Shields, Durham, gentleman. An improvement in furnaces.

36. Edward Hammond Bentall, of Heybridge, Essex, iron-founder. Improved machinery for pulping turnips and other vegetable matters.

38. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. Improvements in the manufacture of Jacquard, piled, or terry fabrics, when parti-coloured yarns are used. A communication.

40. Francis William Gerish, of East-road, City-road. An improvement in the manufacture of cast hinges.

42. William Oliver Johnston, of Broomhill Colliery, Acklington, Northumberland, engineer. An improvement in apparatus used for giving notice when the water in a steam boiler is too low.

44. Henry Bessemer, of Queen-street-place, New Cannon-street, London. Improvements in the manufacture of iron and steel.

Dated January 5, 1856.

46. James Coxeter, of Grafton-street East, Middlesex, surgeons' instrument maker. An improvement in an apparatus for generating steam for medical and other purposes.

48. Joseph Corbett, of Brierly-hill, Stafford, engineer. A new or improved method of preserving the tuyeres of blast furnaces.

50. Conrad Abben Hanson and John Wormald, of Belmont, Vauxhall, Surrey. Improvements in signal and other lamps.

Dated January 7, 1856.

52. Charles Jarvis, of Birmingham, Warwick, ironfounder, and Thomas Deykin Clare, of Birmingham, mineral merchant. A new or improved oven or kiln to be used in the manufacture of coke and pottery, and for heating and drying generally.

54. Thomas Barter, of Hart-street, Middlesex, medical-rubber and bathman. An improved apparatus for administering vapour and douche baths.

Dated January 8, 1856.

60. George Baring Locke, of Notting-hill, Kensington, Middlesex, railway clerk. Improvements in signalling from trains whilst in motion.

62. Henry Stuart, of Liverpool, Lancaster, and Thomas Pritchard, of Runcorn, Chester, watchmakers. Improvements in watches and chronometers, which improvements are also applicable to clocks and other time-pieces.

64. Samuel Middleton, of St. George's-row, Southwark. An improvement in the leather covered rollers used in spinning machinery.

Dated January 9, 1856.

66. George John Christian Erhard Hald, of Manchester, merchant. Improvements in the construction of stoves. A communication.

68. Victor Jeanne, Adolphe Martin, and Michel Edmond Martin, engineers, of Paris, France. An improved grease-box for axles, journals, and other rotary parts of machinery.

70. Edward Hallen, of Cornwall-road, Lambeth, Surrey, civil engineer, and William Holland Kingston, of Bandon, Cork, Ireland. Improvements in communicating between the guards and engine-drivers, and between the passengers, guards, and engine-drivers, of railway trains.

72. Anker Heegaard, of Copenhagen, Denmark, and Regent-street, Middlesex. Improvements in making channels or flues.

74. Charles Mathew Barker, of Kennington-lane, Surrey. An improvement in the pistons of steam engines.

76. Henry Adcock, of City-road. An improvement in casting iron and other metal.

NOTICE OF APPLICATION FOR PROLONGATION OF PATENTS.

A petition will be presented to the Privy Council by Joseph Whitworth, of Manchester, Lancaster, engineer, praying for a prolongation of the several Letters Patent granted to him for England, 2nd August, 1842; for Ireland, 1st November, 1842; and for Scotland, 22nd March, 1843, for "certain improvements in machinery or apparatus for cleaning roads, and which machinery is also applicable to other similar purposes."

On the 3rd of March next an application will be made to the Judicial Committee to fix an early day for hearing the matters in the said petition; and any person desirous of being heard in opposition, must enter a caveat to that effect in the Privy Council office on or before that day.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January 22nd, 1856.*)

2031. Eugene Hippolyte Rascol. An improved fastening for articles of wearing apparel, and for other purposes, as a substitute for buttons. A communication.

2042. Henry Webster. An improvement in the construction of chronometers, clocks, watches, and other time-pieces.

2053. Henry Bull. Railway permanent way materials.

2068. Robert Booty Cousens. Improvements in machinery or apparatus for making casks.

2074. William Church. Improvements in mounting and adjusting ordnance and other fire-arms.

2083. Henry Chandler. Improvements in roasting-jacks.

2088. David Zenner. Improvements in washing and separating pulverised ores and matters. A communication.

2092. Joseph Lewtas. Improvements in apparatus for holding and letting go cords, chains, or bands.

2095. Edward Gibbs. A new or improved manufacture of picture-frames, vases, busts, and such articles as are or may be produced by the process of moulding.

2108. Feridoon Hankey Smith. An improved break for carriages with poles.

2110. William Warren. Improvements in the construction of vices.

2116. Richard Archibald Brooman. Improvements in preserving animal and vegetable substances. A communication.

2123. George Seaborn Parkinson. Improvements in railway-breaks.

2181. Auguste Edouard Loradoux Bellford. Improvements in ventilating hats or other coverings for the head. A communication.

2186. Joseph François Victor Augier. An improved apparatus for extracting the aroma from plants and flowers.

2234. Adolph Coutinho. Improvements in the means of obtaining motive power or continuous motion.

2281. Robert Henry Kay, Alfred Thomas Richardson, and George Malinson. Improvements in the manufacture of plain and ornamental woven fabrics.

2291. John Dewrance. An improvement in the frames of pianofortes.

2403. Peter Cranke Wood. Improved machinery for preparing or scutching flax and other analogous fibrous substances. A communication.

2447. Isham Baggs and Henry Forfar Osman. Improvements in steam-engines, and in engines generally, which are worked either by gas, air, or vapour, and in apparatus for generating electricity for effecting parts of said improvements, and for other purposes.

2580. Duncan Morrison. An improvement in the manufacture of articles with internal screws, when cast-iron, malleable cast-iron, or cast brass is employed.

2809. Robert Midgley and George Collier. Improvements in preparing worsted, mohair, alpaca, cotton, and other yarns.

2815. Alphonse Louis Poitevin. Improved photographic printing.

2816. Alphonse Louis Poitevin. Improved photographic engraving.

2819. John Little. Improvements in heating and cooking apparatus.

2821. John Henry Johnson. Improvements in apparatus for containing compressed air or gases, and in the application of the same to the obtainment of motive power. A communication.

2837. Agnes Wallace and John Wallace. Im-

provements in bleaching, washing or cleansing textile fabrics and materials.

2863. Alfred Vincent Newton. An improved mode of manufacturing wrought iron cannon. A communication.

2875. George Harvey. Improvements in portfolios.

2879. James Fleming, junior. Improvements in bleaching, washing, cleansing, and preparing textile fabrics and materials.

2884. John Barcroft. An improvement in the materials to be used in the manufacture of baskets and basket-work.

2887. David Dunne Kyle. A method of communicating motion.

2889. John Watson. Improvements in the manufacture or production of articles of ladies' dress.

2912. Thomas Cowburn and George Walker Muir. Improvements in steam-boilers and in valves and parts connected therewith.

2924. David M'Callum. Improvements in electric telegraphs.

2946. William Lange. Improvements in biscuit-ovens. A communication.

10. Richard Albert Tilghman. Improvements in the manufacture of iron.

12. Harvey Lewis Sellers and John Littler Talbott. Improved apparatus for measuring and weighing grain, seeds, and other substances. A communication.

42. William Oliver Johnston. An improvement in apparatus used for giving notice when the water in a steam-boiler is too low.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

110. Thomas Potts and James Septimus Cockings.
121. Henry Browning.
123. Orlando Reeves.
128. Robert Neale.
131. Joseph Rock Cooper.
138. Peter Rothwell Jackson.
144. William Riddle.
145. Georges Edouard Gazagnaire.
181. Andrew Edmund Brae.
212. William Tranter.
464. William Spence.

LIST OF SEALED PATENTS.

Sealed January 10, 1856.

1785. Samuel Cunliffe Lister.
1865. William Hudson.
1967. John Gedge.
2237. James Torry Hester.
2257. William Henry Lancaster and James Smith.
2277. John King Westrop and Edward Alfred Sharman.
2285. Henry Gardner.
2345. William Basford.
2362. Pierre Alexandre Leroux and Louis Réné Martin.
2498. Charles Hart.

Sealed January 15, 1856.

1591. Antoine Regazzoli.
1594. Joseph Henry Tuck.
1614. William Smith.
1622. Vincent Scully and Bennett Johns Heywood.
1632. John Henry Woolbert.
1638. Samuel Stocker.
1742. Richard Archibald Brooman.
1756. Joseph Lane.
1762. Richard Albert Tilghman.
1784. Caleb Bedells.
1810. William Mickle.
1816. Auguste Morin.
1826. Charles Evans Reeves.
1828. Louis Turletti.
1848. Samuel Statham and Willoughby Smith.
1914. Frederick Scott Archer.
1940. William Johnson.
1954. Charles Radcliffe.
2278. Richard Albert Tilghman.
2464. James Greenshields.
2530. Joseph Scott.

Sealed January 18, 1856.

1051. Edwin A. Forbush.
1610. Felix Hoyos.
1657. John Walter Cawley Wren.
1659. George Hepplewhite.
1668. Auguste Achard.
1698. Thérèse Alexandrine Poncelin.
1702. Thomas Dawson.
1730. William Truran.
1794. Nathaniel Smith.
1843. Mark Mellor.
2164. Thomas Clegg.
2259. Narcisse Leroy.
2267. John Thornton, Albert Thornton, William Thornton, and Henry Thornton.
2295. Thomas and William Hemsley.
2297. Manuel Perez Lozano.
2299. John Stenhouse.
2305. James Miller Brown and Thomas Brown.
2371. Thomas Richardson.
2391. John Andrew Richards.

Sealed January 22, 1856.

1669. George Handson Rollet.
1674. Henry Stent.
1676. Benjamin Wood.
1677. John Henry Johnson.
1678. John Henry Johnson.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
1855.				
Dec. 31	3799	James Clifton	New Oxford-street	Fore Carriage for Perambulators
1856.				
Jan. 1	3800	T. P. Hawkins	Birmingham	Chain.
3	3801	J. Jobson	Litchurch Works, Derby	Stove-joints
,,	3802	E. Davis	Albion-street, Leeds	Pressure-Gauge
16	3803	R. Frost	Wilson-street, Gray's-inn-road	Screw Barrel Tilt.
21	3804	R. Besley and Co.	Fann-street, Aldersgate-street	Composing Stick.
		PROVISIONAL REGISTRATIONS.		
1855.				
Dec. 28	733	T. Pinder	Nottingham	Spring for Lace-making Carriages.
1856.				
Jan. 12	734	G. Lindsey	Stoke Newington	Gold Pen Hall-marked.
14	735	F. Wilkins	Harley-street	Street Tramway.
21	736	W. H. Bowers	East-road, City-road	Railway Buffer.
23	737	T. Morris	Regent-street	Valve and Air Regulator for Common Stoves.

NOTICES TO CORRESPONDENTS.

C.—Your letters on the theory of locomotives show that you are capable of appreciating a mechanical problem, but show also that you have not studied mechanical philosophy with much system. Your solution of the locomotive question does not thoroughly sift the whole of the problem. We do not understand in what you suppose the weakness of the ordinary view of the matter to lie. The weakness of your own solution is, we believe, that which you suppose to constitute its strength, viz., your refusing to ascribe to the adhesion of the rim of the driving and rail the office of a moving force. This is, in fact, the only one external to engine; and must, therefore, be regarded as the real source of motion. Imagine an engine in which the cylinders are vertical instead of horizontal, and attempt to apply your method to such a case; or make a similar trial in case of a paddle-wheel steamer, and you will, if we do not mistake you, agree with us in the conclusion that your own, and not the old mode of treating the subject, is defective. In fact, the old method includes all that is just in your own. Either the matter must rest here, or you must forward us a re-statement of your theory as concise as possible.

H. L. Phillips.—Yours came too late for insertion in this number.

Erratum.—Last number, page 54, col. 2, line 24 from bottom, *for* "tube" *read* "cube."

CONTENTS OF THIS NUMBER.

Hunt's Patent Advance-Bladed Conoidal Screw Propellers (*with engravings*) 73
Ramsbottom's Improved Safety-Valves and Feed Apparatus for Steam Boilers (*with engravings*) 76
A New and Important Process of Engraving 77
Naval Preparations for the Next Campaign 78
On Tonnage Registration 79
Canal through the Isthmus of Suez 79
The Limited Liability Act. By Charles Wordsworth, Esq. (*Review*) 80
The New Coinage considered in relation to our School Arithmetics. By T. Tate, F.R.A.S. (*Review*) 80
Smokeless Furnaces and Fires: Experiments at Messrs. Brandram and Co.'s Works, Rotherhithe 80
On the Caloric Engine, and on the Nature of Motive Power 82
A Practical Method of Trisecting Angles 85
The Decimal Coinage Question 86
Specifications of Patents recently Filed:

Wilkins	Lamps	86
Ben'Jamin	Gas	87
Bougereau	Roasting Coffee	87
Keevil	Cheese	87
Basebe	Paper	87
Young	Gas-Regulators	87
Bellford	Pumps, &c.	87
Teall	Soapy Waters	87
Chase	Lozenges	87
Simon	Paper	87
White	Drying Grain	87
Bellford	Screw Fastenings	87
Bellford	Pulverizing Quartz	87
Alleyne and Strafford	Railway Brakes	88
Penrice	Propelling	88
Sorel	Applying Adhesive Matters to Stuffs	88
Walker	Projectiles	88
Mowbray	Looms	88
Pearce	Pottery	88
Silbermann	Globes	88
Bellford	Bats for Felting	88
Young	Harrows	88
Page	Shaping Metals	89
Smith	Safety Valves	89
Poole	Sculpturing Marble	89
Bellford	Rotary Pumps	89
Sharp and Yorston	Furnaces	89
Leiss and Schneider	Devices in Mica	89
Ronald	Hemps and Flax	89
Poole	Printing Cylinders	89
Bonnet	Weaving	89
Derégniaux	Spinning	89
Distin	Field Bugles	90
Swinburne	Applying Power	90
Buhler	Fencings	90
Margueritte	Glass and Crystals	90

Provisional Specifications not proceeded with:

Gernon	Articles of Clay	90
Gernon	Plaster of Paris	90
Martinoi and De Lara	Paper	90
Rioux and Pari-Fixing	Metallic Ornaments	90
Shelley	Cooking Utensils	90
Birch	Boat Plugs	90
Green	Huts and Tents	90
Pierce	Yarns or Threads	91
Bellford	Fire-arms	91
Whish	Oscillating Engines	91
Gedge	Measuring Liquids	91
Harris	Crushing Metals	91
Parsons	Moulds for Casting	91
Pouillet	Railways	91
Bucknall	Hats and Caps	91
Raux and Poret	Artificial Mineral Waters	91
Clements	Pocket Fastenings	91

Provisional Protections 92
Notice of Application for Prolongation of Patents 94
Notices of Intention to Proceed 94
Patents on which the Third Year's Stamp Duty has been Paid 95
List of Sealed Patents 95
Notices to Correspondents 96

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, ...blin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1695.] SATURDAY, FEBRUARY 2, 1856. [PRICE 3D.

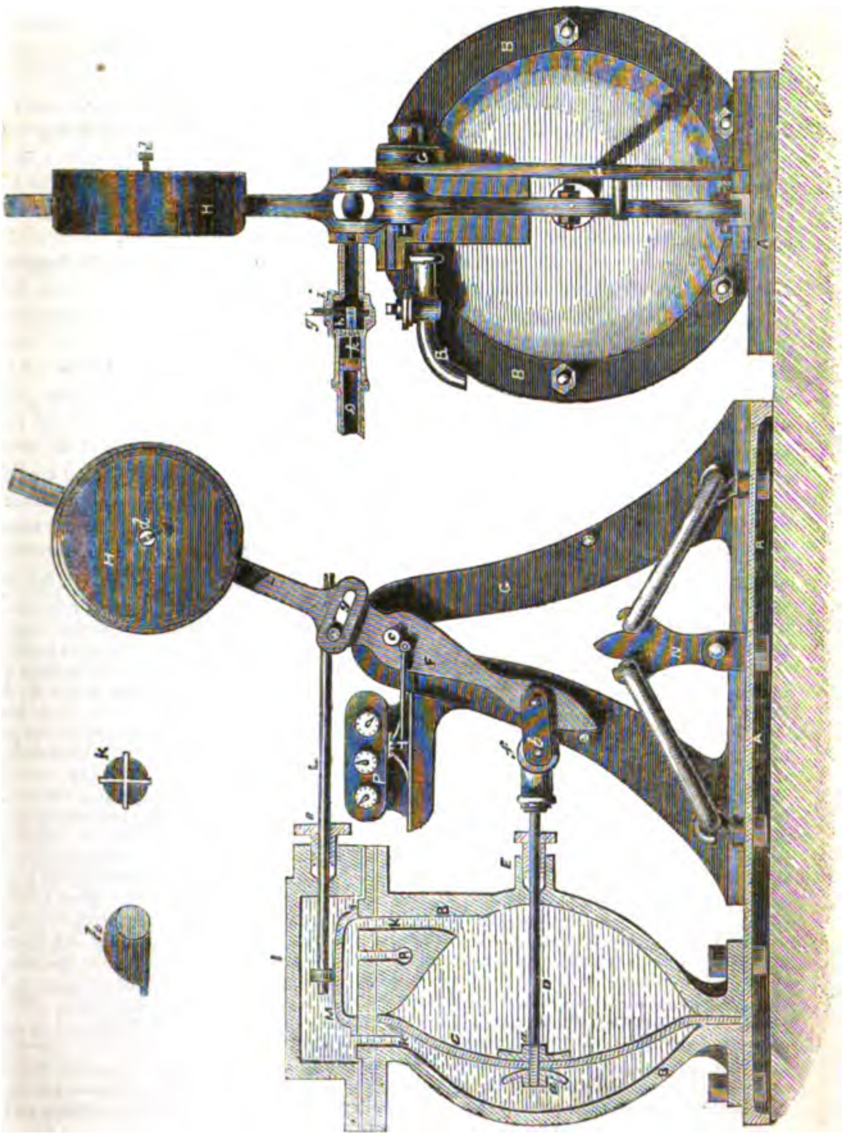
Edited by R. A. Brooman, 166, Fleet-street.

ALDRIDGE'S PATENT FLUID METERS AND TAPS.

Fig. 2.

Fig. 1.

Fig. 3.



ALDRIDGE'S PATENT FLUID METERS AND TAPS.

(Patent dated May 25, 1855.)

Mr. Edward Aldridge, manager of the Boston Waterworks, Lincoln, has recently introduced an improvement in water meters, by which their construction is rendered very simple and inexpensive, and which consists in the employment of a flexible diaphragm fitted inside a spherical or other suitably-shaped vessel, into which water or gas or other liquid or fluid is alternately admitted or expelled through a slide, similar to the slide valve of a steam engine, and which diaphragm is worked by a rod passing through a stuffing box at one side of the vessel and connected to the flexible diaphragm; the quantity of liquid or fluid passing through the vessel being registered by any suitable registering arrangement, worked by the rod which sets the slide in motion; also, an improvement in taps for regulating the flow of liquids, which consists in casting or otherwise fitting upon a shaft, a cam or excentric which bears upon the spindle of a valve which is kept in its seat and closed by a pressure of liquid upon it: on turning the shaft, the rise of the cam forces back the spindle and valve, and opens for the liquid a passage, which is small or wide, according to the swell of the cam and the amount of turn given to the shaft.

In the engravings on the preceding page is shown the manner in which the improved meter, and also the improved tap, are constructed. Fig. 1 represents a sectional and fig. 2 an end elevation. A, A, is a cast-iron bed or base plate, for supporting the working parts of the meter or engine, when this apparatus is used as such. B, B, is a metal vessel, formed in two parts or halves, bolted together; C is a flexible diaphragm, the edge of which is inserted between the halves of the vessel B, and the whole bolted together; D is a rod fixed to the diaphragm C by means of two plates, *a a*, tapped and screwed on each side of the diaphragm. This rod works through a stuffing box, E, in the side of the vessel, and is connected by the links, *b*, to the lever, F, centred at *c*, on a projecting stud pin fixed in a standard or bracket, G, bolted to the base plate, A. At the top of this lever is fixed a balance weight, H, having a set screw, *d*, passing through it to the lever, by means of which the balance weight can be set at any required position upon the lever, according to the pressure of the liquids. I is a valve box, fitted on the top of the vessel, B; and K K, are passages, which alternately form the inflow and outlet for the liquid or fluid; L, is the valve rod, which passes through the stuffing box, *e*, and is connected at one end to the slide valve, M, and at the opposite end to the lever, F, by means of a cross head, *f*, working in a double slot, *g*, as shown, so that the lever may have a greater stroke than the valve rod, L; N is a short lever, working upon a joint fixed to the base plate, A, and fitted with two flexible springs of vulcanised India-rubber or other material. This lever and the springs are to prevent the lever, F, from falling over directly it has passed the vertical line, and serve in combination with the slot, *g*, to keep the valve open until the vessel, B, is filled with the liquid or fluid; after which the lever, F, is liberated from the lever, N, and the sudden jerk caused by the falling of the lever, F, and balance weight gives to the cross head, *f*, a blow sufficient to reverse the slide, and allow the water or other liquid or fluid in the vessel to flow out, and a fresh charge to flow in. O is a rod fixed in a stud pin in the lever, F, and is for the purpose of giving motion to the registering apparatus, P; Q is the inlet pipe to the vessel, B, which is fitted with the improved regulating tap; *g* is a spindle or shaft, having a cam or excentric, *h*, cast upon it, or otherwise fitted thereon or thereto. Fig. 3 represents a detached view of this cam. The spindle, *g*, works in a step in the body of the tap, and the top part passes through the screwed cap, *i*. *k* is a spindle valve, which is fitted into its seat with the back part towards the pressure, the spindle of the valve working up against the lower side of the cam. On turning the spindle, *g*, the rise on the cam forces back the valve, and thereby admits the inflow of the water. When the cam ceases to act against the spindle of the valve, the pressure of the liquid or fluid serves to keep the valve close in its seat. R is the outflow pipe, fitted with a similar valve and cam to those just before described. To employ this meter as a motive power engine, the rod, D, passing through the side of the vessel containing the diaphragm, has to be connected to the machinery to be worked. An engine may have two rods working in the same line connected to the diaphragm, one passing through one side and the other through the opposite side of the vessel.

FARADAY'S EXPERIMENTAL RESEARCHES IN ELECTRICITY.

(*Continued from page* 56.)

Faraday concludes this "Series" of his Researches, with some "General Considerations," from which we make the following extracts:

"(2417.) Such are the facts, which, in addition to those presented by the phenomena of light, establish a magnetic action or condition of matter new to our knowledge. Under this action, an elongated portion of such matter usually places itself at right angles to the lines of magnetic force; this result may be resolved into the simpler one of repulsion of the matter by either magnetic pole. The *set* of the elongated portion, or the repulsion of the whole mass, continues as long as the magnetic force is sustained, and ceases with its cessation.

"(2418.) By the exertion of this new condition of force, the body moved may pass either *along* the magnetic lines or *across* them; and it may move along or across them in either or any direction. So that two portions of matter, simultaneously subject to this power, may be made to approach each other as if they were mutually attracted, or recede as if mutually repelled. All the phenomena resolve themselves into this, that a portion of such matter, when under magnetic action, tends to move from stronger to weaker places or points of force. When the substance is surrounded by lines of magnetic force of equal power on all sides, it does not tend to move, and is then in marked contradistinction with a linear current of electricity under the same circumstances.

"(2419.) This condition and effect is new, not *only* as it respects the exertion of power by a magnet over bodies previously supposed to be indifferent to its influence, but is *new* as a magnetic action, presenting us with a second mode in which the magnetic power can exert its influence. These two modes are in the same general antithetical relation to each other as positive and negative in electricity, or as northness and southness in polarity, or as the lines of electric and magnetic force in magneto-electricity; and the diamagnetic phenomena are the more important, because they extend largely, and in a new direction, that character of duality which the magnetic force already, in a certain degree, was known to possess.

"(2420.) All matter appears to be subject to the magnetic force as universally as it is to the gravitating, the electric, and the chemical or cohesive forces; for that which is not affected by it in the manner of ordinary magnetic action is affected in the manner I have now described; the matter possessing for the time the solid or fluid state. Hence substances appear to arrange themselves into two great divisions—the magnetic and that which I have called the diamagnetic classes; and between these classes the contrast is so great and direct, though varying in degree, that where a substance from the one class will be attracted, a body from the other will be repelled; and where a bar of the one will assume a certain position, a bar of the other will acquire a position at right angles to it.

"(2421.) As yet I have not found a single solid or fluid body, not being a mixture, that is perfectly neutral in relation to the two lists; that is, that is neither attracted nor repelled in air. It would, probably, be important to the consideration of magnetic action to know if there were any natural simple substance possessing this condition in the solid or fluid state. Of compound or mixed bodies there may be many; and as it may be important to the advancement of experimental investigation, I will describe the principles on which such a substance was prepared when required for use as a circumambient medium.

"(2422.) It is manifest that the properties of magnetic and diamagnetic bodies are in opposition as regards their dynamic effect; and, therefore, that by a due mixture of bodies from each class a substance having any intermediate degree of the property of either may be obtained. Protosulphate of iron belongs to the magnetic, and water to the diamagnetic class; and using these substances, I found it easy to make a solution which was neither attracted nor repelled, nor pointed when in air. Such a solution pointed axially when surrounded by water. If made somewhat weaker in respect of the iron, it would point axially in water, but equatorially in air; and it could be made to pass more and more into the magnetic or the diamagnetic class by the addition of more sulphate of iron, or more water.

* * * * *

"(2424.) The endeavour to form a general list of substances, in the present imperfect state of our knowledge, would be very premature; the one below is given, therefore, only for the purpose of conveying an idea of the singular association under which bodies come in relation to magnetic force, and for the purpose of general reference hereafter:—Iron,* nickel, cobalt, manganese, palladium, crown-glass, platinum, osmium, 0° air and vacuum, arsenic, æther,

* This list of substances should have been arranged vertically in the order in which they stand. —ED. M.M.

alcohol, gold, water, mercury, flint-glass, tin, heavy-glass, antimony, phosphorus, bismuth.

"(2425). It is very interesting to observe that metals are the substances which stand at the extremities of the list, being, of all bodies, those which are most powerfully opposed to each other in their magnetic condition. It is also a very remarkable circumstance, that these differences and departures from the medium condition are in the metals at the two extremes, iron and bismuth, associated with a small conducting power for electricity. At the same time, the *contrast* between these metals, as to their fibrous and granular state, their malleable and brittle character, will press upon the mind whilst contemplating the possible condition of their molecules when subjected to magnetic force.

"(2426.) In reference to the metals, as well as the diamagnetics not of that class, it is satisfactory to have such an answer to the opinion that all bodies are magnetic as iron, as does not consist in a mere negation of that which is affirmed, but in proof that they are in a different and opposed state, and are able to counteract a very considerable degree of magnetic force.

"(2427.) As already stated, the magnetic force is so strikingly distinct in its action upon bodies of the magnetic and the diamagnetic class; that when it causes the attraction of the one, it produces the repulsion of the other. And this we cannot help referring in some way to an action upon the molecules or the mass of the substances acted upon, by which they are thrown into different conditions, and affected accordingly. In that point of view it is very striking to compare the results with those which are presented to us by a polarised ray, especially as then a remarkable difference comes into view; for if transparent bodies be taken from the two classes, as, for instance, heavy glass or water from the diamagnetic, and a piece of green glass or a solution of green vitriol from the magnetic class, then a given line of magnetic force will cause the repulsion of the one and the attraction of the other; but this same line of force, which thus affects the particles so differently, affects the polarised ray when passing through them precisely in the *same* manner in both cases; for the two bodies cause its rotation in the *same* direction.

"(2428.) This consideration becomes even more important when we connect it with the diamagnetic and the optical properties of bodies which rotate a polarized ray. Thus the iron solution and a piece of quartz, having the power to rotate a ray, point by the influence of the *same* line of magnetic force, the one axially and the other equatorially; but the rotation which is impressed on a ray of light by these two bodies, as far as they are under the influence of the same magnetic force, is the *same* for both. Further, this rotation is quite independent of, and quite unlike that of the quartz in a most important point; for the quartz by itself can only rotate the ray in the one direction, but under the influence of the magnetic force it can rotate it both to the right and left, according to the course of the ray. Or, if two pieces of quartz (or two tubes of oil of turpentine) be taken, which can rotate the ray *different* ways, the further rotative force manifested by them when under the dominion of the magnetism, is always the *same* way: and the direction of that way may be made either to the right or left in either crystal of quartz. All this time the *contrast* bebetween the quartz as a diamagnetic, and the solution of iron as a magnetic body, remains undisturbed. Certain considerations regarding the character of a ray, arising from these contrasts, press strongly on my mind, which, when I have had time to submit them to further experiment, I hope to present to the society.

"(2429.) Theoretically, an explanation of the movements of the diamagnetic bodies, and all the dynamic phenomena consequent upon the action of magnets on them, might be offered in the supposition that magnetic induction caused in them a contrary state to that which it produced in magnetic matter; that is, that if a particle of each kind of matter were placed in the magnetic field both would become magnetic, and each would have its axis parallel to the resultant of magnetic force passing through it; but the particle of magnetic matter would have its north and south poles opposite or facing towards the contrary poles of the inducing magnet, whereas with the diamagnetic particles the reverse would be the case; and hence would result approximation in the one substance, recession in the other.

"(2430.) Upon Ampère's theory, this view would be equivalent to the supposition, that, as currents are induced in iron and magnetics parallel to those existing in the inducing magnet or battery wire; so in bismuth, heavy glass, and diamagnetic bodies, the currents induced are in the contrary direction. This would make the currents in diamagnetics the same in direction as those which are induced in diamagnetic conductors at the *commencement* of the inducing current; and those in magnetic bodies the same as those produced at the *cessation* of the same inducing current. No difficulty would occur as respects non-

conducting magnetic and diamagnetic substances, because the hypothetical currents are supposed to exist not in the mass, but round the particles of the matter.

"(2431.) As far as experiment yet bears upon such a notion, we may observe that the known inductive effects upon masses of magnetic and diamagnetic metals *are the same*. If a straight rod of iron be carried across magnetic lines of force, or if it, or a helix of iron rods or wire, be held near a magnet, as the power in it rises, electric currents are induced, which move through the bars or helix in certain determinate directions. If a bar or helix of bismuth be employed under the same circumstances, the currents are again induced, and precisely in the same direction as in the iron, so that here no difference occurs in the direction of the induced current, and not very much in force, nothing like so much, indeed, as between the current induced in either of these metals and a metal taken from near the neutral point. Still there is this difference remaining between the conditions of the experiment and the hypothetical case; that in the former the induction is manifested by currents in the masses, whilst in the latter, that is, in the special magnetic and diamagnetic effects, the currents, if they exist, are probably about the particles of the matter."

Faraday next proceeds to make some observations on the peculiar *neutral* condition of air and gases in these magnetic and diamagnetic experiments.

"(2432.) The magnetic relation of aëriform substances is exceedingly remarkable. That oxygen or nitrogen gas should stand in a position intermediate between the magnetic and diamagnetic classes; that it should occupy the place which *no* solid or liquid element can take; that it should show no change in its relations by rarefaction to any possible degree, or even when the space it occupies passes into a vacuum; that it should be the same magnetically with any other gas or vapour; that it should not take its place at one end but in the very middle of the great series of bodies; and that all gases or vapours should be alike, from the rarest state of hydrogen to the densest state of carbonic acid, sulphurous acid, or æther vapour, are points so striking, as to persuade one at once that air must have a great and perhaps an active part to play in the physical and terrestrial arrangement of magnetic forces.

"(2433.) At one time I looked to air and gases as the bodies which, allowing attenuation of their substance without addition, would permit of the observation of corresponding variations in their magnetic properties; but now all such power by rarefaction appears to be taken away; and though it is easy to prepare a liquid medium which shall act with other bodies as air does (2422), still it is not truly in the same relation to them; neither does it allow of dilution, for to add water or any such substance is to add to the diamagnetic power of the liquid; and if it were possible to convert it into vapour and so dilute it by heat, it would pass into the class of gases and be magnetically undistinguishable from the rest.

"(2434.) It is also very remarkable to observe the apparent disappearance of magnetic condition and effect when bodies assume the vaporous or gaseous state, comparing it at the same time with the similar relation to light; for as yet no gas or vapour has been made to show any magnetic influence over the polarised ray, even by the use of powers far more than enough to manifest such action freely in liquid and solid bodies.

"(2435.) Whether the negative results obtained by the use of gases and vapours depend upon the smaller quantity of matter in a given volume, or whether they are direct consequences of the altered physical condition of the substance, is a point of very great importance to the theory of magnetism. * *

"(2436.) The remarkable condition of air and its relation to bodies taken from the magnetic and the diamagnetic classes, causes it to point equatorially in the former and axially in the latter. Or, if the experiment presents its results under the form of attraction and repulsion, the air moves as if repelled in a magnetic medium, and attracted in a medium from the diamagnetic class. Hence it seems as if the air were magnetic when compared with diamagnetic bodies, and of the latter class when compared to magnetic bodies.

"(2437.) This result I have considered as explained by the assumption that bismuth and its congeners are absolutely repelled by the magnetic poles, and would, if there were nothing else concerned in the phenomenon than the magnet and the bismuth, be equally repelled. So also with the iron and its similars, the attraction has been assumed as a direct result of the mutual action of them and the magnets; further, these actions have been admitted as sufficient to account for the pointing of the air both axially and equatorially, as also for its apparent attraction and repulsion; the effect in these cases being considered as due to the travelling of the air to those positions which the magnetic or diamagnetic bodies tended to leave.

"(2438.) The effects with air, are, however, in these results precisely the same as those which were obtained with the solutions of

iron of various strength, (2365.) where *all* the bodies belonged to the magnetic class, and where the effect was evidently due to the greater or smaller degree of magnetic power possessed by the solutions. A weak solution in a stronger pointed equatorially, and was repelled like a diamagnetic, not because it did not tend by attraction to an axial position, but because it tended to that position with less force than the matter around it; so the question will enter the mind, whether the diamagnetics when in air are repelled and tend to the equatorial position for any other reason than that the air is more magnetic than they are, and tends to occupy the axial space. It is easy to perceive that if all bodies were magnetic in different degrees, forming one great series from end to end, with air in the middle of the series, the effects would take place, as they do actually occur. Anybody from the middle part of the series would point equatorially in the bodies above it, and axially in those beneath it; for the matter which, like bismuth, goes from a strong to a weak point of action, may do so, only because that substance which is already at the place of weak action tends to come to the place where the action is strong; just as in electrical induction, the bodies best fitted to carry on the force are drawn into the shortest line of action; and so air in water, as even under mercury is, or appears to be, drawn towards the magnetic pole.

"(2439.) But if this were the true view, and air had such power amongst other bodies as to stand in the midst of them, then one would be led to expect that rarefaction of the air would affect its place, rendering it perhaps more diamagnetic, or at all events, altering its position in the list. If such were the case, bodies that set equatorially in it, in one state of density, would, as it varied, change their position, and at last set axially; but this they do not do; and whether the rarefied air be compared with the magnetic or the diamagnetic class, or even with dense air, it keeps its place.

"(2440.) Such a view would also make mere space magnetic, and precisely to the same degree as air and gases. Now, though it may very well be, that space, air and gases, have the same general relation to magnetic force, it seems to me a great additional assumption to suppose that they are all absolutely magnetic, and in the midst of a series of bodies, rather than to suppose that they are in a normal or zero state. For the present, therefore, I incline to the former view, and consequently to the opinion that diamagnetics have a specific action, antithetically distinct from ordinary magnetic action, and have thus presented us with a magnetic property new to our knowledge."

We should like to quote the whole of these "general considerations," but we have already extracted so largely from this paper, that we must be content with a few sentences more, and refer the reader to the original for further information.

"(2447.) When we consider the magnetic condition of the earth as a whole, without reference to its possible relation to the sun, and reflect upon the enormous amount of diamagnetic matters, which to our knowledge, form its crust; and when we remember that magnetic curves of a certain amount of force and universal in their presence, are passing through these matters and keeping them constantly in that state of tension, and therefore, of action, which I hope successfully to have developed, we cannot doubt but that some great purpose of utility to the system, and us its inhabitants, is thereby fulfilled, which now we shall have the pleasure of searching out.

"(2449.) Though the general disposition of the magnetic curves, which permeate and surround our globe, resemble those of a very short magnet, and therefore give lines of force rapidly diverging in their general form, yet the magnitude of the system prevents us from observing any diminution of their power within small limits; so that probably any attempt on the surface of the earth to observe the tendency of matter to pass from stronger to weaker places of action would fail. Theoretically, however, and at first sight, I think a pound of bismuth or of water, estimated at the equator, where the magnetic needle does not dip, ought to weigh less when taken into latitudes where the dip is considerable, whilst a pound of iron, nickel, or cobalt, ought, under the same change of circumstances, to weigh more. If such should really prove to be the case, then a ball of iron, and another of bismuth, attached to the ends of a delicate balance beam, should cause that beam to take different inclinations on different parts of the surface of the earth; and it does not seem quite impossible that an instrument to measure one of the conditions of terrestrial magnetic force might be constructed on such a principle.

"(2450.) If one might speculate upon the effect of the whole system of curves upon very large masses, and these masses were in plates or rings, then they would, according to analogy with the magnetic field, place themselves equatorially. If Saturn were a magnet, as the earth is, and his ring composed of diamagnetic substances, the tendency of the magnetic forces would be to place it in the position which it actually has.

"(2451.) It is a curious sight to see a piece of wood, or of beef, or an apple, or a bottle of water repelled by a magnet, or,

taking the leaf of a tree, and hanging it up between the poles, to observe it take an equatorial position. Whether any similar effects occur in nature among the myriads of forms which, upon all parts of its surface, are surrounded by air, and are subject to the action of lines of magnetic force, is a question which can only be answered by future observation.

"(2452.) Of the interior of the Earth we know nothing; but there are many reasons for believing that it is of a high temperature. On this supposition I have recently remarked, that at a certain distance from the surface downwards, magnetic substances must be entirely destitute either of the power of retaining magnetism, or becoming magnetic by induction from currents in the crust or otherwise. (*Philos. Mag.*, 1845, vol. xxvii., p. 3.) This is evidently an error. That the iron, &c., can retain no magnetic condition of itself is very probably true; but that the magnetic metals, and all their compounds, retain a certain power of becoming magnetic by induction, whatever their temperature, has now been proved.

"2344, &c.) The deep magnetic contents of the earth, therefore, though they probably do not constitute of themselves a central magnet, are put in the condition to act as a very weak iron core to the currents around them, or other reducing actions, and very likely are highly important in this respect. What the effect of the diamagnetic part may be under the influence of such inductive forces, we are not prepared to state; but, as far as I have been able to observe such bodies have not their power diminished by heat.

(2453.) If the sun have anything to do with the magnetism of the globe, then it is probable that part of its effect is due to the action of the light that comes to us from it; and in that expectation the air seems most strikingly placed round our sphere, investing it with a transparent diamagnetic, which therefore is permeable to his rays, and at the same time moving with great velocity across them. Such conditions seem to suggest the possibility of magnetism being there generated; but I shall do better to refrain from giving expression to these vague thoughts (though they will press in upon the mind), and first submitting them to rigid investigation by experiment; if they prove worthy, then present them hereafter to the Royal Society."

We have thus given, in Faraday's own words, a tolerably copious description of the principal facts and views respecting his two grand discoveries of the *Action of Magnetism on Light* and *Diamagnetism.* It has been impossible to convey anything like a satisfactory notion of these subjects to our readers without making very extensive extracts from Faraday's work; and as it is, we have been compelled to omit much that we should have liked to quote, and which would have thrown additional light on the phenomena. The succeeding series of these "Researches" are on the Connection of Diamagnetism and the Crystalline Forms of Bodies; to which we shall proceed in our next "Notice," and endeavour to give some of the most remarkable and interesting of Faraday's results in that portion of the subject. (*To be continued.*)

THE WAGES OF ARTIZANS IN THE ROYAL DOCKYARDS.

Great dissatisfaction prevails just now among the artizans—particularly the shipwrights—of the Government dockyards, in consequence of the striking discrepancy which exists between the wages received by them, and those obtained (in many cases by far inferior workmen), in private ship-building yards. This feeling rose so high last week in Portsmouth dockyard, that after having fruitlessly waited for some time for the fulfilment of an engagement which had been made by the authorities, to investigate the grounds of their complaints, some hundreds of the shipwrights went in a body, to the principal officers of that establishment, to seek redress. For a long time past, the Admiralty have made but one reply to each and all of the allegations made by the workmen respecting the lowness of their pay, and this reply is in substance as follows: "The constancy of the employment offered you in the royal service, and the pension you will be entitled to receive after you have worn yourselves out in that service, are considered to be equivalent to the excess of wages received by workmen in the private service."

Now while we frankly admit that each of the considerations here mentioned is deserving of attention, we most entirely deny that they can be shown to possess the value claimed for them. For, in the first place, ship-building, and consequently ship-repairing, have recently so much increased, and continue to so much increase, that any skilful and sober shipwright may safely rely upon steady and continuous employment; and, in the second place, every schoolboy knows how small a trifle a week, paid into an Assurance Society, from the age of two or three and twenty, will be sufficient to secure an annuity of £20 or £24 after the lapse of twenty, thirty, or forty years.* On the other hand it is a notorious

* Practically but comparatively few men are pensioned off from the dockyards much before the age of sixty.

fact, that shipwrights frequently earn in private ship-building yards, not less than two, three, and sometimes four, or even more shillings per day above the wages paid in the Royal dockyards.

The consequence is, that the shipwrights in the Government yards are actually compelled to purchase constancy of employment (which hundreds of them would command elsewhere), and a pension of £20 a year (not to be demanded till they become decrepit), at the rate of several shillings, ready cash, per day! The exaction is so monstrous, that the men are not only justified in their resistance to it, but are really bound, in justice to themselves and their families, to oppose it by all prudent and legitimate means.

An organized demonstration in favour of an advance of wages in a dockyard differs from a similar movement in private services in one important respect; for, while the latter is directed against an employer, the former is directed against persons who are merely administrators of the public funds. Neither a superintendent of a dockyard, nor the surveyor of the Navy, nor a lord of the Admiralty is an employer, in the same sense as is a proprietor of a factory or of a shipyard. They are but servants themselves, and are to be held responsible to others for their acts. Therefore in opposing any unjust regulation of theirs, the workmen do not necessarily incur the responsibility which belongs to those who attempt to coerce capitalists in their business transactions. This consideration is very important, and has great weight with the workmen themselves, many hundreds of whom are among the most orderly and well-regulated artisans of this country.

This wages question, like many other of the evils of our dockyards, springs from the predominance of the naval influence there exerted over that of the mechanical officers. Post captains and admirals are by their professional training totally disqualified for many of the duties they assume at the Admiralty and in our dockyards. This is a matter from which immense injury to the public service springs, and is too deep to be discussed here. The past year or two has seen more than one man who is known to be a valuable quarter-deck officer, stretch his flag over a dockyard in which he has done but little more than supervise the removal of stray chips and fragments of grass from the thoroughfares, and interfere with and impede the progress of the mechanical operations so improperly committed to his control.

ON THE PAST AND PRESENT CONDITION OF THE RIVER THAMES.

A paper on the above subject was read at the Institution of Civil Engineers, on the evening of January 22, 1856, by Mr. H. Robinson, Assoc. Inst. C. E.

In a preliminary sketch it was shown, that the Thames had always excited considerable interest in the country, and that some change, or projected improvement in its condition, was rarely, if ever, excluded from the topics of the day.

The principal statistical facts connected with the river were enumerated.

A description was then given of the various abuses which existed, during the last century, in the management of the upper navigation, and the efforts made to improve the disgraceful condition of the river.

Leaving the upper navigation of the river, the paper then referred to its condition in that part within the bounds of the metropolis.

The various schemes for embanking the shores were then alluded to, and the partial good already affected was noted. Among the larger designs were those of Sir Christopher Wren, Mr. Martin, Messrs. Walker and Burges, and others.

The first part of the paper having been occupied in considering the Thames as a highway for commerce, the latter portion was devoted to describing the other functions which it, in common with all rivers, was intended to fulfil, the condition into which it had fallen, and the means proposed for restoring it to something like its normal condition.

The various causes which had induced the present polluted condition of the Thames were next described.

A short history was then given of the steps taken by the late Commissioners of Sewers to remedy the putrid condition of the river. Mr. Frank Forster had originally arranged a system of intercepting sewers, by which the sewage of London was intended to be conveyed below Greenwich, and there discharged into the river; at an expense of one million and a quarter sterling. Nothing was, however, done for want of funds; subsequently Mr. Bazalgette, under the orders of the Commissioners, extended and completed the plans, and at an expense of three millions, laid out a complete system of intercepting sewers. The increased amount of the estimates rendered still more difficult the execution of the works, and nothing was done till the commencement of the past year, when public feeling loudly demanding some amelioration in the condition of the Thames, it was

resolved to make at least a commencement; but all progress was stopped, the Board disunited, and some of its most efficient members lost to it, by a controversy which arose regarding the size of the sewers, and by the official Government support, which was given to the pipe sewer party, in opposition to the decided opinions of the Consulting Engineers, the majority of the Board, and their responsible professional advisers; this controversy still continued, and involving, as it was made to do, the question of asserted considerable economy, would, probably, still divide the new Metropolitan Board.

It was stated to be partly with a view to prevent a result so much to be deplored as the continuation of the present condition of the river, that the author of the paper had proposed a plan, already described in our pages. (See *Mechanics' Magazine*, No. 1686, Vol. lxiii. p. 515.) This plan was to be discussed at the next meeting of the Institution.

A NEW CEMENT AS HARD AS MARBLE.

By an article in the *Chemist* we learn that M. Sorel has submitted to the Academy of Sciences a new cement of great solidity, which consists of a basic oxy-chloride of zinc, obtained by moistening oxide of zinc with the liquid chloride of the same base, or in another chloride isomorphus with the chloride of zinc; for example, protochloride of iron, manganese, nickel, cobalt, &c. These chlorides may be replaced with hydrochloric acid.

He obtains a cement so much the harder as the chloride is more concentrated and the oxide more heavy. He employs washed residues arising from the manufacture of white zinc, or else calcines to redness ordinary white zinc. He employs chloride f zinc, marking from 50° to 60° of Beaumé's areometer; and in order that the cement may set less quickly, dissolves in the chloride about three per cent. of borax or salammoniac, or else calcines the oxide, after having moistened it with water containing a small quantity of borax.

The mastic or cement obtained by the combination of the above substances may be run into moulds like plaster. It is as hard as marble; cold, moisture, and even boiling water are without action on it. It resists 300° C. (576° Fahr.), and even the most powerful acids attack it only very slowly.

The new plastic matter is not expensive, but its cost may still be considerably diminished by being mixed with the oxide of zinc, metallic, silicious, or calcareous matters, such as iron filings or borings, iron pyrites, blende, emery, granite, marble, and all hard calcareous matters. Soft matters, such as chalk and ochre, will not do.

The highest and most varied colours may be given to the new cement, which allows of its being used for tables and mosaic pavements of great hardness and beauty. M. Fontenelle, the sculptor, has used it with success for this purpose, and mosaics formed with the new cement may be seen in the choir of St. Etienne-du-Mont, at Paris.

This cement may also be employed for making moulded objects of art, such as statues, statuettes, medallions, bas-reliefs, &c. It is also perfectly suitable for making ceilings; and (which proves the insolubility of the new cement) several good dentists of Paris have employed it for several years for filling decayed teeth, and even for cementing the pieces of a set of teeth; but the most important application of this new matter would probably be its employment for painting buildings, in place of oil paint.

THE LATE PARIS EXHIBITION.

Several cases of just dissatisfaction on the part of English exhibitors, with the treatment received by them in connection with the late Paris Exhibition, have come under our notice. One of the worst of these is the case of Mr. Chesterman, of Sheffield. It appears that on the examination of one of Mr. Chesterman's cases, containing a number of excellent specimens of improved cutlery, by one of the juries, he was appointed to receive a silver medal. After the award was made, it was found that his stand of goods did not come under the cognizance of that jury, who, thereupon, agreed that their secretary should write to the jury under whose cognizance it did come, desiring them to award the medal to him. Some jurymen, however, took part of the goods and put them in their pockets, thus depreciating the stall, and the secretary appears to have forgotten to send the letter to the other jury. The result was that no notice was taken of the case, which cost £50, although it contained seven distinct patents of fancy articles, in which the French had unsuccessfully been trying to cope with the firm for fifteen years.

It was only to be expected that in carrying out such an undertaking as the Exhibition in question, some bungling and mismanagement would occur; but we think the instance abovementioned is of an altogether inexcusable character, and one against which there ought to be some appeal. We hope, for the sake of the public confidence,

that Mr. Chesterman will yet find means for obtaining the redress of so serious a grievance.

PROPOSED SCIENTIFIC COLLEGE AT NEWCASTLE-UPON-TYNE.

THE mining engineers of the north of England propose to found a college in Newcastle, with a capital of at least £30,000. Mr. Wood, an eminent coal viewer, and President of the Mining Institute, a short time ago brought under the notice of the Duke of Northumberland the intention to found a college, and requested that his Grace would lend his assistance to the movement, and become patron of the college. The noble Duke, in answer to this appeal, signified to Mr. Wood, that in case the amount of subscribed capital should reach £15,000, his Grace would add £5,000 to that sum, making it £20,000; and if it should reach £30,000, his Grace would subscribe £10,000, making £40,000. This, as might be expected, has given an impetus to the design, and it is now intended forthwith to apply to the other wealthy coal-owners of this district for their support to the undertaking. Application will also be made to the leading manufacturers, as it is intended that the college shall give instruction in other branches of science besides those more immediately bearing on coal-mining operations. It is also stated that Mr. Stephenson, M.P., President of the Institution of Civil Engineers, is about to present £3,100 to the Literary and Philosophical Society of Newcastle, an equal amount having been collected by the members, for the purpose of paying off a debt of £6,200 contracted some time since by the Society.

THE SMOKE QUESTION.

THE Steam Collier Association at Newcastle-on-Tyne are preparing a boiler to test the various designs sent in to compete for the £500 prize offered by the association for the effectual consumption of smoke with a due regard to the economy of fuel. A great number of plans have been offered, and the experiments were expected to be very interesting.

THE SCREW PROPELLER.

MR. F. P. SMITH has just received a life pension of £200 per annum from the Government, in consideration of the efforts made and expenses incurred by him, in the introduction of the screw propeller into the Royal Navy and Mercantile Marine of this country.

Useful Information for Engineers;] *being a Series of Lectures delivered to the Working Engineers of Yorkshire and Lancashire; together with a Series of Appendices, containing the Results of Experimental Inquiries into the Strength of Materials, the Causes of Boiler Explosions, etc.* By WILLIAM FAIRBAIRN, F.R.S., F.G.S., &c., &c. London: Longman and Co. 1856.

WHEN Mr. Fairbairn publishes a work to which he gives the striking title of "Useful Information for Engineers," the mechanical world becomes necessarily anxious to know its contents; we therefore hasten to lay an account of it before our readers. The volume contains ten chapters, of which the first is on the construction of boilers; the second on boiler explosions; the third and fourth on the consumption of fuel, the concentration of heat, and the prevention of smoke; the fifth on the necessity of incorporating with the practice of the mechanical and industrial arts, a knowledge of practical science; the sixth on iron ship building; and the last four on steam and steam boilers. The first of the series of Appendices consists of an experimental inquiry into the strength of wrought-iron plates and their riveted joints, as applied to ship building and vessels exposed to severe strain; the second of experimental researches to determine the strength of locomotive boilers, and the causes which lead to explosion; the third of an account of the boiler explosion at Rochdale; the fourth of an account of the "association for the prevention of steam-boiler explosions, and for effecting economy in the raising and using of steam;" the fifth reports on the smoke nuisance; the sixth an account of the experiments on the iron targets at the Arsenal, Woolwich; and the last of a few notes.

The work consists, as the preface informs us, of a series of lectures, most of which were prepared at the request of the directors of the various educational institutions of the north of England, and delivered to the mixed assemblies of their members. It is not to be expected that such lectures would include any large amount of original facts, or novel investigations; indeed, a work to

be fitly entitled, "Useful Information for Engineers," must base its principal pretensions upon a useful and accurate expression of the well-established facts connected with engineering science, and must avoid everything that is either doubtful or purely speculative. This Mr. Fairbairn has borne in mind, and has accordingly made it his object to impart to working engineers, in intelligible and simple terms, all he himself knew of the various branches of practical science which their calling embraces, and his main reliance has been on the results of his own successful practice and broad experience.

It is very gratifying to observe that Mr. Fairbairn employs unhesitatingly all the weight of his professional opinion to support Mr. C. Wye Williams in his efforts to promote the application of truly scientific principles to the removal of not only the smoke nuisance, but also the wasteful consumption of fuel attendant upon the production of smoke. We do not wish it to be understood that Mr. Fairbairn pledges himself to the accuracy of every statement or opinion of Mr. Williams; we mean that the labours of that gentleman are spoken of with the greatest respect throughout the work, and his treatise on "The Combustion of Coal," &c., referred to, in many instances, as a high authority on the subject. This should be received as an encouragement by Mr. Williams, and as a warning to those individuals who are interested in detracting from his merits.

We cannot, we believe, speak too highly of the utility of this work to practical engineers. If it were thoroughly studied and mastered—both the body of it and the invaluable appendices upon which it is to some extent founded—by practical men throughout the country, the good effects produced by it would be incalculable. At the same time we feel bound to say that it is not a perfect production. It contains more than one passage, the soundness of which we could not ourselves guarantee; the following for example: "Heat, from its want of *ponderosity*, is highly elastic, and when enclosed in films of water in the form of globules, its specific gravity is many thousand times less than that of water. The particles of heat to a certain extent radiate from a fire in every direction; but it will be found in open space that the tendency is upwards, and that more particularly when imparted to water, when the globules are produced all over the bottom, and make their ascents vertically," (page 148).*

* On the following page an awkward error occurs through the number 10·8 being printed without the decimal point, (and consequently appearing as 108.)

Again, we cannot approve of the little importance Mr. Fairbairn sometimes appears to attach to mathematical investigations. If such investigations are defective, their defects are readily discoverable, and should be pointed out by a competent person; otherwise the conclusions drawn from them will certainly have weight with many persons. If Mr. Fairbairn finds himself at variance with all eminent mathematicians, he may be sure that his theory is wrong; and in that case it will not avail to say, "The conclusions to which I arrived" (in respect to an accident on the Lancashire and Yorkshire Railway,) "although *practically right, were, however, considered by some mathematically wrong*, as they were firmly combated by several eminent mathematicians; but notwithstanding the number of algebraic formulæ, and the learned discussions of my friends on that occasion, I have been unable to change the opinions I then formed."—(Page 28.)

Lest, however, the foregoing remarks and extracts should create a false impression in the minds of any of our readers respecting Mr. Fairbairn's views on the importance of theoretical knowledge, we subjoin a passage from pages 96 and 97 upon the subject:

"It is absurd to talk against theory, as if a knowledge of the exact sciences was a dangerous and a useless attainment; nothing can be more erroneous than this impression, as on close inspection there is no practice without theory, any more than there is no effect without a cause. In the useful arts, theory can only be considered dangerous when it is not reducible to practice, and the real meaning of the term *theory*—which creates so much alarm in the minds of practical men—is neither more nor less than a series of definite rules by which practice is governed, and through which we derive, from fixed and definite laws, those sound and definite results which, of all others, it is the primary object of practice to accomplish. In the mechanical arts how difficult, precarious, and unsatisfactory are the thoughts of men unacquainted with first principles, and how very often does that deficiency lead them into malconstruction, and those errors which a knowledge of science would teach them to avoid! It is true that some of our first engineers, and some of our most ingenious mechanicians, have been men of limited education—men of humble origin; but how much more perfect would have been their labours, had the emanations of their minds and their subsequent constructions been based upon the unerring laws of natural science!

"A knowledge of the exact sciences must be valuable under every circumstance

of life; and this knowledge, when united to sound judgment, is irrevocably the forerunner of a sound and perfect construction. I could multiply examples where ignorance, as a pretender to knowledge, has been productive of the most untoward results, not only in abortive attempts at construction, but in those on which the lives and property of individuals depend. It is not an uncommon occurrence to witness in works of this kind the most glaring imperfections, a waste of material, and a total want of proportion, arising from the absence of this knowledge; and in order to lessen the number of those discrepancies, our practical men should be educated, and that education should be accompanied with the conviction that sound practice can never be attained without some definite rule for its guidance. Fully impressed with these views, and the advantages to be derived from theory in the exercise of a well-founded practice, I shall endeavour to prove from evidence which I possess, that theory and practice are the twin sisters of science, and cannot be separated without endangering the connection, or destroying the beauty, harmony, and solidity of construction."

Before concluding this notice with an important extract or two from the work itself, we venture to suggest that the expensive form in which it is published will effectually prevent many hundreds of the class for whom it is designed from obtaining it. We recommend to the consideration of the author and publishers the propriety of shortly issuing a cheap edition of it for the use of working men. We believe that such an edition would prove remunerative, and we are quite certain that it would be of vast service to such persons.

"RECOMMENDATIONS FOR THE PREVENTION OF THE SMOKE NUISANCE.

"1st. Engineers and stokers should be instructed to charge their fires, commencing from the end nearest the bridge; and before throwing coal on the furnace, the incandescent or partially burnt fuel must be spread, in order effectually to cover the grate-bars, and prevent the admission of a surcharge of cold air between them at any uncovered part.

"2nd. The draught of the furnace may be regulated by the damper, which, in slow combustion, is only raised a few inches, in order to retain the heat as long as possible in the flues and round the boiler, time being an element in combustion. *Where active firing* is required, and the charges of coal are made in varying quantities and at intermittent intervals, doors on the ash-pit and slides to regulate the supply of air to the gases will be preferable to the use of the damper.

"3rd. The furnace or grate-bars should be kept clean and free from clinkers, for the purpose of admitting as much air as may be necessary to combine with the solid or incandescent fuel, and a sufficient number of orifices should be made at the door for the admission of the required supply of air to effect the combustion of the *gaseous* portion of the coal evolved in the chamber of the furnace, and above the fresh charge.

"4th. In every case where it can be accomplished, the boilers, steam pipes, and every part exposed to the atmosphere should be carefully clothed and covered with non-conducting material to prevent the escape of heat.

"5th. In all cases of active combustion, the system of the diffusion of air through the furnace-doors, behind the bridge, or in both, should be used to prevent the air having a cooling effect.

"6th. In the construction and erection of boilers, the pyrometer and sight holes should be used; the first to ascertain the varying temperatures in the flues, the admission of air and mode of charging the furnace; and the second, to enable the fireman to observe the varying internal state of the flues and furnace, either as regards combustion, flame, or smoke.

"Lastly. Proprietors of steam engines should ascertain by experiment the quantity of coal necessary to perform a given quantity of work; and the engineer, or those responsible for the working of the boilers, should be allowed a premium on the quantity of coal saved, and be subject to a proportionate fine for neglect, or for permitting the appearance of smoke."—(Pp. 88, 89.)

"HIGH PRESSURE STEAM.

"With all these facts before us, and taking into consideration the superior economy of high steam, *worked expansively*, it is quite evident, that in all future constructions, either of boilers or engines, we must look forward to the use of a greatly increased, instead of a reduced pressure of steam. Indeed, I am so thoroughly convinced of the advantages inseparable from this application, as to urge upon you the necessity of preparing for greatly increased progress, and greatly increased pressure in all the requirements, appliance, and economics of steam as a motive power. It must appear obvious to every reflecting mind, that steam generated under pressure, and compressed into one-fifth or one-sixth the space that it formerly occupied, and that again applied to an engine of little more than one-third the bulk, must be a desideratum in the appliance of an agent so powerful, and so ex-

tensively used. Look at our locomotives of the present day, and tell me whether we are or are not successfully progressing in effecting a closer alliance between the two sister sciences of mechanics and physics; and tell me whether or not the community is not secured equally well from risk, and greatly benefited by the change? Let us calculate, for example, the duty performed, and the force applied to one of our largest class of locomotive engines travelling with a train at the rate of 45 miles an hour, and we shall find the amount of power given out to exceed that of 700 horses, or as much as would be required to drive the machinery in some of our largest factories. And why not work our factories upon this principle? and why not propel our largest ships by engines of this description? There is no reason why it should not be done, and that with greatly increased economy, by introducing a well-directed system of condensation along with that of highly attenuated steam.

"I give you these impressions from a conviction of their utility; and I am persuaded the time is not far distant when this will be accomplished to a much greater extent than may at present be considered possible or safe; and the time is fast approaching when we shall lessen our space and double our power with greatly increased economy and effect."—(Pp. 192, 193.)

SMOKELESS FURNACES.

To the Editor of the Mechanics' Magazine.

"The best laid schemes of mice and men oft gang a-gley."

Sir,—In the absence of Mr. Parker, I am constrained to accept the somewhat startling and unlooked for statement of Mr. Brandram, given at page 38, of the failure of Mr. Parker's (and other patentees') plans for consuming smoke when applied to Messrs. Brandram's furnaces. I have the less difficulty in the matter, as Mr. Brandram's last communication, at page 80, very fully and satisfactorily explains the *reason* of these failures. It is not that the boiler-maker was in fault (as Mr. Williams would perhaps argue, judging from what appears at p. 37 of your present volume). Neither is it that the smoke-consuming plans which passed through the fiery ordeal of Mr. Brandram's furnaces were necessarily of themselves defective or inefficient. The truth is very candidly admitted by Mr. Brandram, viz., that his works were deficient in boiler power, full 25 per cent., to compensate for which, the furnaces were overdriven; destroying Mr. Parker's air-box, and no doubt also entailing excessive wear and tear of fire-bars, &c., &c. According to a very old proverb, "Dear-bought experience is best," and Mr. Brandram seems disposed to put the full value upon his own acquisition. The experience of a neighbour, however, might have taught him some five-and-twenty years ago, a *fact* which he has only just now learned for himself—that with properly proportioned boilers and furnaces, skilfully managed, no smoke-consuming apparatus whatever is required.

Of the large number of boilers now in use, more than one-half are short of the power required, and of the others more than half are unskilfully tended. Mr. Williams, in his admirable work on Combustion, alludes to the defective proportions of boilers and furnaces with reference to the production of steam, but overlooks the effect which this has upon the production of smoke. Smoke-consuming apparatus, it would appear, only becomes necessary as a remedy for one or other of the above-named evils. It becomes then a most important question, but very difficult of solution, as to what extent, want of capacity in the boiler and furnaces, can be remedied so far as the non-production of smoke is concerned, by supplementary apparatus; and also, how far smoke-consuming apparatus can be made automatic, and rendered independent of neglect, or of wilful mismanagement.

Smoke-consuming patentees have much to contend with, in the shape of mismanagement; they are, to a frightful extent, at the mercy of every fireman, who sometimes in connivance with, in other cases in opposition to, the wishes of their employers, frequently produce very unexpected and very unsatisfactory results. A short time since, I overheard a conversation between two engine-drivers, on the subject of *smoke consumers*, when one of them said, "We have got ——'s plan fitted to our furnace; but I'll soon have the d—d thing out!" As the plan alluded to works well, he has not yet succeeded in carrying out his threat; but I apprehend he ultimately will. Mr. Williams says, "The facility with which the stoker is enabled *to counteract the best arrangements* naturally suggests the advantage of *mechanical feeders*." *

The same writer also shows in detail the astounding difference produced by skilful and unskilful stoking. (See page 47.) One of the main elements of success in Mr. Brandram's experiment resulted from his "patience and perseverance in instructing the workmen." In another case failure was alone prevented "by care and attention on the part of the workmen."

The only patent plan retained by Mr. Brandram is Wright's (James Watt's?), and consists in passing the *black smoke* from

* Treatise on Combustion, p. 117.

the front of the furnace, through the *bright fire* at the back; a proceeding denounced by Mr. Williams as utterly fallacious, and adverted to as "the old error in supposing that passing the gas over red-hot fuel would effect its consumption!"

In my humble opinion, Mr. Williams is right *chemically*—Mr. Brandram, *practically*; that is to say, he by this means practically succeeds in escaping the pains and penalties of the Act of 1853, but does not succeed in producing the *perfect combustion* so earnestly contended for by Mr. Williams.

Disguise the fact as we may, the Act of 1853 turns entirely upon management: "If any person shall *use* any furnace which shall not be constructed so as to consume or burn its own smoke; or shall so *negligently use* any such furnace," &c. And the explanation of Mr. Brandram supplies a key to the solution of many of the failures of smoke-consuming apparatus which have come under magisterial investigation, and paid the penalty for not doing an absolute impossibility.

In the hard case of the miller, quoted by Mr. Williams (*vide Mech. Mag.*, page 37), had he attempted to shift the responsibility upon the boiler-maker, would he not probably have been met with the charge of *negligent use?* a charge, too, which a skilful stoker might have gone very far (upon a trial) to substantiate. Of course it is not for the miller "to teach the engineer how to construct the apparatus he undertakes to make;" but it is the miller's province to see that the apparatus is worked "with proper *care* and *attention*," and not so *negligently* as to create a nuisance in the neighbourhood.

"That those who undertake to make boilers shall make them in all respects perfect," is not all sufficient, seeing that Mr. Williams himself asserts the power of the stoker, either wilfully or negligently, to counteract "the best arrangement."

In this, as in almost every other matter,

"Whate'er is best administered, is best."

I am, Sir, yours, &c.,

WM. BADDELEY.

13, Angell-terrace, Islington,
Jan. 29, 1856.

To the Editor of the Mechanics' Magazine.

SIR,—Observing in your last week's number a very clear and practical statement, by Mr. Brandram, relative to "Smoke Consumption," I take the opportunity of bearing testimony to the efficiency of the "Inverted Bridge," over the centre of the fire, or nearly so, which is there claimed for a Mr. Wright. I am not aware of this gentleman's claim, the same having been in use in the engineering manufactory of the late Joseph Bramah and Sons, Pimlico, for more than forty years, and was superseded about fourteen years ago, in consequence of the substitution of tubular for the previously used waggon boilers, to both of which this simple and effective contrivance was attached. It will also be found published in the year 1825, in a treatise on warming and ventilating, page 279, (Underwood, Fleet-street,) a tracing of which engraving I herewith send you. It was applied in various forms in fire-brick and metal pockets to the boilers during the last twenty-five years. The necessity for consuming the smoke at that early period (fifty years ago) was the contiguity of the manufactory to the Old Buckingham Palace.

I am, Sir, yours, &c.

AMHERST H. RENTON.

8, Hanover-chambers, Buckingham-street, Adelphi, Jan. 30, 1856.

THE CALORIC ENGINE.

To the Editor of the Mechanics' Magazine.

SIR,—I have read with considerable pleasure the remarks of several of your correspondents in reference to the views of Mr. Ericsson, but I confess that as yet I am not satisfied that those views comprise an absurdity. I am not *sanguine*, far from it, that he will utilise heat in a greater measure than may be effected by steam; but I yet require conviction that heat may not be twice used. For let us suppose that a reservoir of air of ordinary density be heated until it possesses an elastic pressure equal to two atmospheres: if this air be conveyed beneath a piston, it will operate with a pressure of 30lbs. on the inch; and as there is only a resistance of 15lbs. per inch to overcome on the other side of the piston, the difference will be mechanical effect, the measure of mechanical effect being always the sum of this difference. Suppose, now, the stroke of the piston to be completed, and the supply of heated air changed to the other side, the cylinder being filled with heated air, the resistance to motion is now as yet equal to the pressure. The question between Mr. Ericsson and his adversaries here arises, and consists in the inquiry whether it be possible to abstract by absorption a portion of this heat, thus reducing the elastic pressure and consequent resistance.

Of course my opinion in taking this view is, that the diminishing resistances on the exit side of the piston are necessary to the operation of dynamic effects on its other side, but not that these diminishing resistances are indicative of an equal and entire consumption of the heat represented by the

operative forces, never to be restored and rendered efficient by a renewal of proper conditions, so much of these conditions being clearly possible as there is heat abstracted during the passage of the air through a regenerator, so called, to the atmosphere or elsewhere, and *re-absorbed by cooler air* passing through it to the heating chamber.

I am not defending this scheme, and should be glad to see my way through it a little clearer to something useful; but I do not yet think it demolished.

I am, Sir, yours, &c.,
J. RAMSBOTTOM.

Accrington, Jan. 28, 1856.

PHILLIPS' FUNERAL CARRIAGE.

To the Editor of the Mechanics' Magazine.

SIR,—The objections of the gentleman who has in your Number of January 12th, so kindly noticed my design, are, I think, quite unfounded. He says, "The body is dishonoured by the men sitting upon it." I think there is little difference between the present mode and the one I suggest, and if anything the improvement is in my favour; and as to the men in cold weather "executing the double shuffle upon it," I must reply by asking the gentleman, what undertaker would be so lost to a sense of decency and decorum as to allow his men on such a solemn occasion to do so, and that in the presence of those who are near and dear to the deceased? In the next place, "The mourners' legs would not touch the bottom of the carriage by six inches." I presume the writer is of the dwarf genus, since the height of the intended seat will be 18 inches (the usual height in most of the coaches of the present day). The individual must have the legs of an infant; but in all probability the vehicle will be provided with a stool when the "Mourner for P.," or his children, honour the same with their company. Next, "The draught would be heavy," &c. Having consulted some of the most eminent coachbuilders of the day, who gave it as their opinion that the funeral carriage described would be on a right equilibrium, also that the motion would be easy, I am disposed to think that there the writer must be wrong again. Fifthly. "Its ugliness would kill the sextons." This last objection can be easily obviated by the "Mourner for P." pensioning them off, in his desire for the welfare of mankind.

I am, Sir, yours, &c.,
H. LAVEROCK PHILLIPS.

166, Bermondsey-street, Jan. 23.

ON THE FORM OF THE MOON.

To the Editor of the Mechanics' Magazine.

SIR,—A short time ago I wrote a few lines on the subject of the moon's figure.* I now beg to say, that I have been forestalled by a great many years by Lagrange, as appears in the "Annuaire pour l'an 1844. Par le Bureau des Longitudes." In the article, "*Notice sur les Principales Découvertes Astronomiques de* LAPLACE." *Par* M. ARAGO."

I am, Sir, yours, &c.,
J. SIMON HOLLAND.

Woolwich, Jan. 28, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

WALKER, H. *Improvements in ploughs for ploughing or tilling land.* Patent dated June 28, 1855. (No. 1471.)

This invention consists in the application of one or more extra coulters to ploughs for tilling land, and in certain other modifications of ploughs.

RAYWOOD, J. *An improved method of stopping railway trains.* Patent dated June 28, 1855. (No. 1472.)

This invention mainly consists in the introduction of one or more additional rails, and the application of the breaks to the rails, as well as to the wheels.

MOREAU-DARLUC, C. *An improved mode of separating substances of different nature or composition by means of displacement and substitution.* Patent dated June 28, 1855. (No. 1473.)

This invention consists in the application to various useful purposes of the principle of forcing a jet of atmospheric air, gas, or gases, into a suitable closed vessel, to act on the liquid or menstruum with which substances from which certain soluble parts are to be abstracted are moistened or impregnated, these substances being contained in the said vessel on a perforated false bottom; also, in the application of electricity to the dilating of the air, gas, or gases above mentioned, or to the decomposition of certain matters, parts of which are to be forced through the substances to be treated, or to the decomposition of the substances to be subjected to this process.

SYMONS, C. J. *Certain improvements in steam engines.* Patent dated June 28, 1855. (No. 1474.)

Claims.—1. Constructing steam engines with a fixed piston, and a moveable horizontal cylinder supported on a pair of wheels, and having attached to it a bracket

* *Mechanics' Magazine*, vol. lxiii., p. 371, No. 1680.

or brackets, guided by a guide or guides, and carrying a connecting rod or rods which communicate the motion to a crank or cranks. 2. A certain mode of supporting the piston of the foregoing, or "truck engine," by means of two piston rods, or one deep flat piston rod firmly fixed to a pillar or support. 3. Constructing "truck engines," and engines with vertical or inclined moveable cylinders and fixed pistons, with sliding or jointed pipes for the entrance and exit of the steam. 4. Constructing single-acting engines named "impinging engines," having a moveable cylinder inclosing and working upon an inner fixed cylinder which is filled with steam and provided with a suitable valve or valves for the entrance and exit of the steam which acts upon the outer cylinder. 5. Constructing certain other engines, named "band engines," as described.

DAVEY, S. *An improvement in the manufacture of safety fuses for mining and military purposes.* Patent dated June 28, 1855. (No. 1475.)

This invention, in so far as it relates to safety fuses for mining purposes, consists in the application of a thread saturated with an inflammable composition; and in so far as it relates to fuses for military purposes, consists in combining several inflammable threads in one tape, and coating it with gutta percha.

ENGSTROM, C. C. *Improvements in breech-loading ordnance, and the balls or projectiles thrown by cannon.* Patent dated June 28, 1855. (No. 1476.)

In carrying out this invention the breech of a piece of ordnance is made with an opening through it to receive a breech plug; this opening is of larger dimensions in one direction than in the other, so that a breech plug with lugs on its two sides may pass when in one position through the opening in the breech, and after being turned partially round, be prevented by the lugs from being forced back. A steel ring is employed to make the plug fit tightly against its seating, and the plug is covered externally with a kind of door. The projectiles are fitted with projections. The invention also comprises methods of forming gun-carriages in two parts, &c.

BESLEY, R. *An improved manufacture of metallic alloy, applicable to the casting of type and other articles.* (A communication.) Patent dated June 28, 1855. (No. 1478.)

This improved alloy is formed of 100 parts of good virgin lead; 30 of regulus of antimony; 20 of tin; 8 of nickel; 5 of metallic cobalt; 8 of copper; and 2 of bismuth. As nickel and cobalt will readily unite with copper, but will not form a perfect union with antimony, the nickel and cobalt are first melted with the copper and a small quantity of bismuth, and then the mixture is added to the alloy containing the antimony with continued stirring.

SKELLEY, J. *Improvements in the construction of carriage-wheels.* Patent dated June 28, 1855. (No. 1479.)

The first part of this invention consists in employing a sort of inner wheel, between the nave and felloes, in which some of the spokes stop short. The second part consists in the application of an extending tennon or nose-piece to the points of the spokes of a wheel, whereby the felloes or rim may be caused to expand and bear hard against the tyre. The third part consists in forming the surface of the tyre which comes against the rim hollow, and in rounding the rim to fit it.

BELLFORD, A. E. L. *Improvements in manufacturing, lighting, and heating gases.* (A communication.) Patent dated June 28, 1855. (No. 1480.)

This invention consists in generating carburetted hydrogen; *First*, by throwing at once a large quantity of coal into a well-closed furnace which contains incandescent coke. *Secondly*, By continually dropping into the furnace and through a suitable aperture, a jet of coal powder from a chamber supplied with the same, by means of a funnel and a cock adapted to it. *Thirdly*, By letting a jet of steam saturated with tar, or any other hydrocarburet, down through a layer of incandescent coke. *Fourthly*, By letting pure or hydrocarburretted steam through the smelted iron which is thus transformed into iron of superior quality, or into steel.

HUGHES, E. J. *An improved method of concentrating the colouring matter of madder, munjeet, spent madder, or any preparations thereof.* Patent dated June 29, 1855. (No. 1483.)

The inventor takes a fibrous or porous substance, such as cotton, wool, or sponge, and steeps it in a mordant calculated to combine with the colouring matter of madder, &c. When the material is thoroughly saturated, he subjects it to the action of the necessary processes to remove the acid and thoroughly precipitate the mordant on the material, as is usually done in calico printing. He then puts the material thus prepared into water along with the madder or any preparations thereof. He heats the water and leaves it a sufficient time to allow all the colouring matter to combine with the mordant fixed on the material, after which he exposes the material to the action of a strong acid, such as sulphuric, muriatic, &c., either slightly or much diluted, for a sufficient length of time to dissolve or decompose the mordant and carbonise or dis-

solve the fibrous or porous material. When this is accomplished he puts it on a filter and washes and neutralizes it until the acid is removed. The residue is then the concentrated colouring matter he wishes to obtain.

LORENZI, J. B. DE. *Certain improvements in the construction of organs.* Patent dated June 29, 1855. (No. 1484.)

This invention consists—1. In a peculiar arrangement of stops and sounding boards in organs. 2. In improved mechanism for increasing and diminishing the tone of the notes. 3. In obtaining a vibratory or trembling sound by means of certain expansive bellows.

DEMBINSKI, H. *Improvements in the process and apparatus for generating steam without combustible matter, except in accidental cases.* Patent dated June 29, 1855. (No. 1485.)

"The principle of my said invention is based," says General Dembinski, "upon obtaining the necessary heat to produce steam from any suitable liquid, by the use of iron or any other suitable metal, either by friction or percussion with other substances, keeping the friction material permanently heated and partially elastic."

ECCLES, J. *Improvements in the manufacture of bricks, tiles, and other articles made of plastic materials, and in machinery and arrangements or apparatus to be used for the purpose.* Patent dated June 29, 1855. (No. 1486.)

This invention relates, first to the construction of a machine, composed of a drum or lever carrying teeth, and driven by steam, which machine is to be used for raking down clay from banks, &c. It relates, secondly, to arrangements where steam power is employed, whereby the waste heat from the boiler and engine is employed in heating a shed for drying bricks, &c., and consists in placing the boiler or boilers in the drying shed or under its floor; also, in causing the flue or flues of steam boilers to pass through the shed or under the floor in going to the chimney; also, in employing the exhaust steam from high-pressure engines to heat water which is caused to circulate through pipes passing through the drying sheds; also, in employing (in addition to the heat from the sources before mentioned) steam from the boiler circulated by pipes through the shed as an auxiliary means of heating or drying the air in the shed. It relates, thirdly, to certain arrangements of kilns by means of which the heat which passes off from a set of cooling bricks is transferred to a set of drying bricks.

WEEMS, J. *Improvements in drying grain and other substances.* Patent dated June 29, 1855. (No. 1489.)

This invention mainly consists in a mode of drying grain and other substances by passing through them currents of air, first heated by passing over, or in contact with, steam-heated surfaces.

WOODCOCK, W. *Improvements in machinery for making bricks and other articles of plastic materials.* Patent dated June 30, 1855. (No. 1490.)

This invention consists in the application of an inclined trough to those machines for making bricks, &c., in which a circular horizontal table is employed, and in combining therewith sliding dampers by which the proper quantity of plastic material is supplied to the moulds; also in machinery for raising these dampers.

BARLING, T. *Improvements in steam-engine boiler and other furnaces.* Patent dated June 30, 1855. (No. 1491.)

The inventor provides hollow iron firebars arranged so as to keep in them a constant supply of water or steam, which latter is discharged up the chimney to increase the draught. The bridge is built on an arch or other suitable support in such manner that it entirely occupies the space between the back surface of the grate and the boiler bottom or top of the flue, thereby compelling the air and gaseous products to pass through the mass of solid fuel and the bar spaces, whence the flame and products of combustion pass under the bridge to the boiler bottom and flues. The front of the ash-pit is closed with a door, and the mouth of the furnace is left open or partially closed, and the draught regulated by a door or other contrivance.

BIRCH, J. *Improvements in the manufacture of iron.* Patent dated June 30, 1855. (No. 1493.)

In arranging his improved furnaces, where the back tuyere is situated the inventor builds a refinery furnace. Then he employs reducing and oxidizing tuyeres to smelt and refine at one operation, in order to dispense with the coke now required for the present refinery fire. He also effects a saving of the coke used in the remelting of the pig iron in the refinery surfaces by placing a suitably constructed refinery furnace in the immediate neighbourhood of the old blast furnaces. In the hearth boshings and tymps of the blast furnaces he places metal tubes with water circulating therein to lessen their wear and tear. He also constructs refinery furnaces with arrangements for blowing the blast through the water boxes which surround the fire, and places the air box and pipes below the fire to blow direct from the blast pipe so as to dispense with the necessity for erecting pillars and uprights, and to run the metal from the blast furnace into the refinery furnace, thus melting and refining at one heat.

TOOTH, W. H. *Certain improvements in*

the machinery for, and in the manufacture of, earthenware and plastic articles, and in the preparation of clays and other materials. Patent dated July 2, 1855. (No. 1494.)

These improvements comprise certain methods of forming cores which shall form channels, grooves, or slots in the clay as it is forced through the dies, &c.

LYCETT, F. *An improved glove, together with the means of manufacturing the same.* Patent dated July 2, 1855. (No. 1496.)

This invention consists of an improved glove, formed in such manner that there are no side seams to the hand part, and the method of manufacturing the same consists in cutting pieces of the material of which the glove is to be composed in one or other of certain sets of forms, and then uniting the parts of each set of forms together, as described.

MACKELT, R. *Improvements in machinery for etching or engraving designs on cylindrical or other surfaces.* Patent dated July 3, 1855. (No. 1499.)

This invention consists in transferring designs for etching or engraving purposes from a flat surface to cylindrical or flat surfaces by means of pendulum levers acting on adjustible studs and other parts in combination therewith, whereby the proportion in size between the original design and that produced on the surface to be etched or engraved may be varied to any extent within certain limits.

GUILLAUME, G. *Certain improvements in machinery for communicating power to the wheel or axle of steam or other engines, or for carriages to be propelled by hand or foot.* Patent dated July 4, 1855. (No. 1500.)

This invention consists of a one-way crank or lever, composed of a single or double arm (with or without balance weights) fitted loosely at one end to the axle or to the stock of the wheel, having the power to turn backwards but not forwards by ratchet wheels or other means. The one-way crank is put into action by working rods which carry a roller or slippery surface fixed to them.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

RUSSELL, F. *An improved mode of hanging windows and shutters.* Application dated June 27, 1855. (No. 1466.)

This invention is intended to apply mainly to carriages. A strap or band is attached to the bottom of the sliding window or shutter-frame, and passed over an anti-friction roller, and thence to a spring barrel mounted in bearings at the lower part of the door.

LUCAS, T. *Improvements in the manufacture of iron.* Application dated June 27, 1855. (No. 1469.)

This invention consists in combining a smelting or blast furnace with a reverberating, puddling, or refining furnace, so that the metal from silicate or other ores, as it becomes fused in the former, shall flow direct and without detention into the latter without being exposed to the atmosphere.

LILLEY, G. *An improvement in water meters.* Application dated June 28, 1855. (No. 1477.)

This invention consists in placing any suitable liquid measuring apparatus (by preference that for which William Parkinson obtained letters patent the 20th March, 1849,) in the upper part of an air vessel, into which water is admitted from any given height through a pipe opening into such vessel, and near the bottom thereof, and from which water is carried away through another pipe, also opening into the same vessel and near the bottom thereof, which outlet-pipe delivers the water at any level lower than that of the head of water admitted into the feed-pipe. By this invention water may be measured at any level below that at which it is supplied, and at which it is required to be delivered.

FONTAINEMOREAU, P. A. L. DE. *Improvements in axle-boxes or plummer-blocks.* (A communication.) Application dated June 29, 1855. (No. 1481.)

This invention relates to an improved construction of axle-box or plummer-block, by which the journal of the shaft is intended to be more effectually lubricated or greased than in the modes hitherto adopted.

BUSSON, C. A. *An improved mode of constructing and fixing the teeth of toothed cylinders employed in the treatment of textile or fibrous materials.* Application dated June 29, 1855. (No. 1482.)

This invention consists "in forming the working surface of picking or other cylinders for treating fibrous or textile materials, by means of bands of steel or any other suitable metal, a part of the breadth of which is bent up at a right angle in the entire length of the bands, and in which part the teeth are punched or cut out, and after having sufficiently curved the bands, the same are wound round and fixed with their smooth part in a spiral direction, and in a continuous line, against the working surface of a cylinder."

BROADBENT, J., and S. P. YOULE. *Improvements in machinery or apparatus for cutting out the gores of umbrellas and parasols, which said improvements are also applicable to cutting out forms or shapes for other purposes.* Application dated June 29, 1855. (No. 1487.)

This invention consists in cutting out gores or other shapes by means of cutting edges or blades fixed upon the outer surface of a roller. Another roller is employed as

a bed roller, for the knives or blades to cut against.

HEAPS, W. *Improvements in machinery or apparatus for working or cultivating land.* Application dated June 29, 1855. (No. 1488.)

These improvements consist in imparting a lateral vibrating or reciprocating motion to the teeth of the harrow during the forward movement of the machine.

JOHNSON, W. *Improvements in the manufacture or production of manures.* (A communication.) Application dated June 30, 1855. (No. 1492.)

This invention relates to the dissolving or reduction of all kinds of animal matter, such as hair, wool, silk, skin, or rags, and the refuse of these several substances; also feathers, fish, flesh, membranes, fibrine, horn, hoofs, and other animal products, by the agency of caustic alkali and caustic lime.

MIGNON, J. A. *Improvements in maps, charts, plans, &c., of great dimensions, to render them more portable and useful.* Application dated July 2, 1855. (No. 1495.)

These improvements consist in making certain maps and plans of large dimensions.

KNAPTON, W. *Improvements in furnaces for effecting the consumption of smoke.* Application dated July 2, 1855. (No. 1497.)

This invention consists in the employment in furnaces of two fire-places, or one fire-place divided lengthwise in the centre from the fire-bars to the top of the furnace, with passages at each end, leading from one fire-place into the other, or from one side of the partition to the other. These passages are commanded by dampers or valves after the fires have been lighted. The fire-places are charged alternately, and, by means of the valves, cause the smoke and products of combustion, generated from the fresh supply of fuel in one, to pass through the other in which the fuel is in an incandescent state, whereby all the consumable products of combustion are consumed prior to their passing off into the chimney.

HAMMANT, W. *A new apparatus for condensing smoke.* Application dated July 3, 1855. (No. 1498.)

This invention consists in the construction of an air-tight apparatus, to be affixed over the top or flue of any stove or furnace, thus preventing the ascent of the smoke generated into those parts of the chimney or chimney-shaft situate above the said apparatus; and in affixing to some convenient part of such apparatus a metal tube communicating therewith, and opening at one end thereof into some part of the space between the fire and the top of the air-tight apparatus; the other end of such tube being conveyed into a tank. A communication is thus opened for the conveyance of the smoke into the tank, so that by inserting in such a tube a screw which shall, whilst the condensing apparatus is in use, be kept constantly revolving in one direction, a vacuum is created, and the smoke so generated is drawn through such tube and forced into the tank.

PROVISIONAL PROTECTIONS.

Dated September 29, 1855.

2170. Henry Bernoulli Barlow, of Manchester. Improvements in mules and other machines of the like nature for spinning and doubling cotton and other fibrous materials. A communication.

Dated October 15, 1855.

2301. John Micklethwaite, of Leipzig, gentleman. An improvement in propelling and steering vessels.

Dated October 16, 1855.

2309. William Cotton, of Loughborough, Leicester, manufacturer. Improvements in the manufacture of looped fabrics.

Dated October 24, 1855.

2375. James Smith, of Liverpool, Lancaster, baker. Improvements in apparatus for giving alarm signals, and for extinguishing fires.

Dated November 23, 1855.

2641. Augustus Dacre Lacy, of Hall House Knayton, near Thirsk, Yorkshire, gentleman. Machinery or apparatus for agricultural purposes, to be used in combination with stationary steam power.

Dated November 24, 1855.

2647. John Elce, of Manchester, machine-maker, and George Hammond, of the same place, watchmaker. The employment of a new material in the manufacture of wicks for moderator-lamps.

Dated November 27, 1855.

2672. Edward Peyton and Duncan Morrison, of Bordesley Works, Birmingham. Improvements in the construction of metallic bedsteads and other articles to sit or recline upon.

Dated November 29, 1855.

2695. James Egleson Anderson Gwynne, of Essex-wharf, Essex-street, Strand, Middlesex, engineer. Improvements in instruments for indicating pressure or vacuum.

Dated December 3, 1855.

2717. Frederick Walton, of Wolverhampton, Stafford, manufacturer. An improvement or improvements in papier maché trays.

Dated December 4, 1855.

2725. William Hartcliffe, of Salford, Lancaster, machine-maker. Certain improvements in weighting the top rollers of machinery used in preparing and spinning cotton and other fibrous materials.

Dated December 11, 1855.

2795. John Horsley, of Cheltenham, Gloster, analytical chemist. Certain means of treating quinine and iodine, and other mineral medicines, in order to cause them to combine with cod-liver-oil, or any other fish-oil, or with seed-oil.

Dated December 15, 1855.

2838. Samuel Twist, of Birmingham, Warwick, cabinet-maker. Improvements in casters for furniture and other purposes.

manufacturer, and William Whittle, of Smethwick, Stafford, engineer. Improvements in the manufacture of hooks and eyes, and in machinery to be employed in the manufacture of the hooks aforesaid.

2903. William Stevenson, of Lochwinnoch, Renfrew, manufacturer, and William Crawford, of the same place, wool-spinner. Improvements in machinery or apparatus for carding or preparing fibrous materials.

2905. Isaac Atkins, of New Basford and Marygate, Nottingham, lace manufacturer, and Marmaduke Miller, of Wollaton-street, Nottingham, gas regulator manufacturer. Improvements in apparatus for measuring and regulating the flow of gas.

2907. William Henry Zahn, of New York, United States. Improvements in wind-mills or wind-engines.

2909. James Chesterman, of Sheffield, York, mechanist. An improved sp·ing, especially applicable to the joints of knives, razors, scissors, and other like articles.

Dated December 24, 1855.

2911. Sylvain Mathurin Gillet-Oudin, of Blois, France. Improvements in making bread.

2913. William Symons, jack-maker, of Tavistock, Devon. Improvements in the suspension roasting-jack.

2915. George Lean, of Glasgow, Lanark, manufacturer, and Robert Thomson, of the same place, manager. Improvements in weaving.

2917. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in treating beetroot and other saccharine vegetable substances, in order to extract alcohol therefrom, and at the same time render or leave the remaining parts of the vegetable fit food for cattle. A communication.

Dated December 26, 1855.

2919. Alexandre Tolhausen, of Duke-street, Adelphi, Middlesex, interpreter at the imperial court of Paris. Certain improvements in double-acting pumps. A communication from D. W. Clark, United States.

2921. Frank Clarke Hills, of the Chemical Works, Deptford. Improvements in economising fuel.

2923. Thomas Duppa Duppa, of Longville, Salop. Improvements in generating and heating steam. A communication.

2925. Charles May and Edward Alfred Cowper, of Great George-street, Westminster. Improvements in combing wool and other fibrous substances, and in machinery for that purpose.

Dated December 27, 1855.

2927. Edward Alfred Cowper, of Great George-street, Westminster. Improvements in combing wool and other fibrous substances, and in machinery for that purpose.

2929. Nicholas Douglass, of St. George's-in-the-fields, Middlesex, engineer. Improvements in the construction of lighthouses, beacons, piers, and other similar erections.

2931. James Edgar Cook, of Greenock, Renfrew, booking clerk. An improved composition for preserving exposed surfaces, or surfaces liable to deterioration and decay.

Dated December 28, 1855.

2933. Jean Jules Robert, secretary of the Society for the Encouragement of Arts and Industry, Portugal-street, Lincoln's-inn-fields, Middlesex. The fabrication of torrified beetroot to supersede chicory as used in coffee, and with a great superiority.

2937. Paul Marie Salomon, of Rue Neuve, St. Eustache, Paris, France. Improvements in the manufacture of gas from peat, and in the coke resulting therefrom, and also in the apparatus connected with that manufacture.

2939. William Rowett, of Liverpool, Lancaster, merchant. An improved mechanical arrangement for lifting weights and other useful purposes.

2941. John Pemberton Turner, of Birmingham, Warwick, manufacturer. A new or improved method of shanking metallic buttons, applicable to the heading of nails and other like purposes. A communication.

Dated December 29, 1855.

2943. Herbert Redfern, of Shelton, Stafford. Improvements in skates.

2945. John Broadbent, of Manchester, Lancaster, merchant, and Stanley Peter Youle, of the same place, gentleman. Improvements in machinery or apparatus for cutting out the gores of umbrellas and parasols, which said improvements are also applicable to cutting out forms or shapes for other purposes.

2947. William Brown, of Glasgow, Lanark, merchant. Improvements in cooking and culinary vessels and utensils, and in the application and conveyance of heat.

2949. Silvester Lees and Edward Lees, of Oldham, Lancaster, cotton spinners, and George Henry Newton, of the same place, mechanic. Certain improvements in machinery for spinning and doubling cotton and other fibrous substances.

2951. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. An improved process of tanning. A communication from C. C. Knoderez, of Strasbourg, leather manufacturer.

Dated December 31, 1855.

2953. Charles Cowper, of Southampton-buildings, Middlesex. Improvements in the treatment of coal, and in the purification, desiccation, and agglomeration of coal, and in machinery and apparatus for such purposes.

2955. James Taylor, of the Britannia Works, Birkenhead, Chester, engineer. Improvements in apparatus for raising and lowering weights.

2957. James Cochran Stevenson and John Williamson, of South Shields, alkali manufacturers. Improvements in the manufacture of soda and alkali.

Dated January 1, 1856.

1. Henry Truelove, of Liverpool, Lancaster, teacher. Improvements in gloves.

3. John Calvert, of the Strand, Middlesex, mining geologist. Improvements in extracting metals from their ores.

5. William Beckett Johnson, manager for Messrs. R. Ormerod and Son, engineers, Manchester, Lancaster. Improvements in steam-boilers and engines.

7. John Thurrell, of Castle-street East, Oxford-street, Elizabeth Mary Muller, of Greek-street, Soho, Middlesex, and John Robert Chidley, of Gresham-street, London, gentleman. Improvements in transmitting fac simile copies of writings and drawings by means of electric currents.

Dated January 2, 1856.

9. William Bullough, of Blackburn, Lancaster, mechanic. Improvements in machinery or apparatus for sizing yarns.

11. George Hamilton, of Great Tower-street, London, gentleman. Improvements in apparatus for weighing.

Dated January 3, 1856.

13. Richard Gill, of Grove-terrace, Pomeroy-street, New-cross, Kent. Improvements in the arrangement and construction of the fire flues and passages of steam-boilers, for facilitating and improving the combustion of smoke.

15. Charles Toye, of Gloucester-street, Queen-square, Bloomsbury, Middlesex, mechanic. Improvements in terry fabrics.
17. Joseph William Schlesinger, of Northfleet, Kent, mechanical engineer. Improvements in the mode of using emery, glass, and sand, or other substances on linen or other material, and in the machinery applicable to the manufacture thereof.
23. Alan Stewart, of Regent-street, Middlesex, and of Rue de la Paix, Paris, France, consulting mechanical surgeon. Improvements in measuring the human figure, and in fitting garments thereto.
25. Colin Mather, of Salford Iron Works, Manchester, Lancaster, machinist, and Charles Millward, of Salford, Lancaster, engine manager. An improvement in steam and vacuum gauges.
27. John Fowler, junior, of Bristol. Improvements in machinery for giving motion to ploughs and other implements used for cultivating land.

Dated January 4, 1856.

29. Henry Bernoulli Barlow, of Manchester, patent agent. Certain improvements in machinery for carding cotton and other fibrous substances. A communication from Camille de Bast, of Ghent, Belgium.
31. Charles Hart, of the Vale of White Horse Iron Works, Wantage, Berkshire, agricultural engineer. Improvements in portable steam-engines, and in apparatus connected therewith, for tilling and cultivating land.
33. Robert Grey, of Ridley-place, Newcastle-on-Tyne, builder and brickmaker. Improvements in machinery or apparatus for moulding bricks, tiles, and other similar articles.
35. Thomas Key, of Bethnal-green. An improved knive cleaning machine.
37. Joseph Wright, of Burton-upon-Trent, Stafford, engineer and iron-founder. Improvements in furnaces and fire-bars.
39. Joseph Betteley, of Liverpool, Lancaster, chain cable manufacturer. An improvement in the rolling of iron for the making of ships' knees.
41. Robert Sam North, of Derby, engineer, and Ralph Peacock, of New Holland, Lincoln, engineer. Improvements in metallic packings for pistons.
43. William Saint Thomas Clarke, of Charing-cross, Middlesex, gentleman. Improvements in ventilation.

Dated January 5, 1856.

45. Raymond Kammerer, of Ostend, and Charles Brewer, of Chelsea, Middlesex. Improvements in electric clocks or timekeepers.
47. Henry Hindle, of Cavendish-street, Ashton-under-Lyne, Lancaster. Improvements in valves or apparatus for regulating the flow of steam and gas.
49. Louis Auguste Thérèse, of Paris, French empire, saddler. Certain improvements in harness.

Dated January 7, 1856.

51. Victor Delperdange, engineer, of Rue Verte, Schaerbeck, Brussels, Belgium. Improvements in metallic and elastic packing.
53. Samuel Cunliffe Lister and William Tongue, of Bradford, York. Improvements in machinery for combing wool, cotton, and other fibrous materials.
55. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in machinery for boring and excavating. A communication.
56. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved mode of manufacturing rods, shafts, and tubes of iron and steel. A communication.

Dated January 8, 1856.

58. Matthias Edward Bowra, of Basinghall-street, London. Improvements in the nature and manufacture of waterproof garments and other goods.
61. Edwin Thomas Truman, of Old Burlington-street, Middlesex, dentist in ordinary to Her Majesty's household. Improvements in artificial palates and teeth.
63. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Certain improvements in Jacquard machines. A communication from J. Marin and L. P. de Maligny, of Lyon.

Dated January 9, 1856.

65. John Talbot Pitman, of Gracechurch-street, London. An improved mode of applying diastase and heat to the saccharification of starch. A communication from F. V. O. Hyckert, of Stockholm, Sweden.
69. William Barrie, of Maida-hill, Middlesex, Commander R.N. An improved reflective leveller. A communication from Adolphe Morlot, of Montreux.
73. Lambert Alexandre, of New York, United States. Improvements in propellers for vessels.
75. William Watson, of Leeds, York, manufacturing chemist. Improvements in the arrangement of furnaces.

Dated January 10, 1856.

77. Martin Billing, of Birmingham, Warwick, stationer, and Frederick Augustus Harwood, of Birmingham, machinist. New or improved machinery for the manufacture of paper bags.
78. John Darlington, of Albert street, Newington, Surrey. Improvements in the manufacture or production of zinc or spelter.
80. Jane Ann Herbert, of Waterden-place, Guildford, Surrey, widow. An improved method for extracting the dirt, or the gum, or the colouring matter, or the principle from various vegetable or animal substances or materials. A communication.

Dated January 11, 1856.

81. James Fernihough, of Dukinfield, Chester, boiler maker, iron founder, &c. Improvements in steam boilers and apparatus for consuming smoke.
82. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in cards for Jacquard mechanism. A communication from G. Mesmer, of St. Louis, France, manufacturer.
83. John Henry Johnson, of Lincoln's inn-fields, Middlesex, gentleman. Improvements in railway breaks. A communication from J. B. M. A Cochot, of Paris, France.
84. Thomas Charles Clarkson, of High-street, Wapping, Middlesex. A combination of certain materials for forming and making improvements in ship and other pumps, tubes, and which is also applicable for ship, carriage, and other building purposes and parts thereof.
85. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. A new and improved method of curing meats, preserving provisions, and ventilating and cooling buildings, cars, and vessels. A communication.
86. William Pole, of Storey's-gate, Westminster, engineer, and Frederick William Kitson, of Leeds, York, engineer. Improvements in railway wheels.
88. William Routledge, of Salford, Lancaster, engineer. Improvements in cocks or valves for regulating the flow and pressure of steam, water, or other fluids.

Dated January 12, 1856.

90. Emile Constantin Fritz Sautelet, chemist, of Paris, French Empire. An improved process of tanning.
92. Harry Emanuel, of Hanover-square, Middlesex, silversmith. Improvements in the manufacture of spoons, forks, and other similar articles in metal. A communication.

Dated December 22, 1855.

2901. James Newman, of Birmingham, Warwick,
94. Richard Kemsley Day, of Plaistow, Essex. Improvements in the manufacture of fuel.

Dated January 14, 1856.

96. Alexandre Tolhausen, of Duke-street, Adelphi, Middlesex, Interpreter at the Imperial Court of Paris. Certain improvements in balanced slide valves for steam-engines. A communication from E. D. Leavitt, jun., United States.

98. Adolf Pollak, of Vienna, Austria. A new fusee or cigar light.

100. Edward Hammond Bentall, of Heybridge, Essex, ironfounder. An improvement in the construction of machinery for cutting and pulping turnips and other vegetable matters.

102. Austen Chambers, of Canterbury, and William Harrison Champion, of Lynsted, Kent. An improved mode of working railway breaks.

104. Anne Emilie Malteste, of Paris, France, milliner. Improvements in shirts.

106. William Owen, of Rotherham, York, ironmaster. Improvements in stoves and fire-places.

Dated January 15, 1856.

108. Joseph Hostage, Thomas Ives Brayne Hostage, and John Tatlock, of Chester. Improvements in railway chairs.

110. Thomas Hill Bakewell, of Welford-road, Leicester, clerk. Improvements in ventilating, warming, and cooling rooms and other places.

Dated January 16, 1856.

112. Henry M'Evoy, of Hall-street Works, Birmingham, Warwick. Improvements in locks, latches, and staples.

114. William Prangley, of Salisbury, Wilts, professor of music. A novel instrument for exercising the third finger, and thereby facilitating the playing upon musical instruments.

116. John Abraham, of Birmingham, Warwick, machinist. New or improved machinery for the manufacture of percussion-caps, and for cutting out and raising articles in metal generally.

118. Johnson Thompson, of Sunderland, builder. Improvements in ships' keelsons.

120. John Fowler, junior, of Bristol. Improvements in machinery for ploughing land.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

122. Henry R. Worthington, of New York, United States. A machine for measuring the flow of liquids, called a fluid metre. January 16, 1856.

160. John Wordsworth Robson, of Grundy-street, Poplar New-town, Middlesex, engineer. Improvements in machinery appertaining to water-closets and pumps. January 21, 1856.

170. Dundas Smith Porteous, of Paisley, Renfrew, Scotland. A rotatory engine. January 22, 1856.

NOTICE OF APPLICATION FOR PROLONGATION OF PATENT.

A petition will be presented to the Privy Council by John Lee, of Brunswick-street, Southwark, gentleman, praying for a prolongation of the patent granted to him 3rd August, 1842, for "Certain improvements in wheels and axle-trees to be used on railways and in other machinery, for stopping on or preventing such carriages from running off railways, which improvements may also be applied to other carriages and machinery."

On the 1st March next, an application will be made to the Judicial Committee to fix an early day for hearing the matters in the said petition; and any person desirous of being heard in opposition must enter a caveat to that effect in the Privy Council office on or before that date.

NOTICE OF APPLICATION FOR LEAVE TO FILE DISCLAIMER.

A petition has been presented to the Attorney-General for leave to file a disclaimer to parts of the specification of the Patent granted to Thomas Bury, Walter Glover, James William Speed, and John Hardman, of Salford, Lancaster, for "improvements in machinery or apparatus for stretching, drying, and finishing yarn and woven fabrics composed of cotton, wool, silk, or other fibrous materials." Dated 14th February, 1854.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January* 29*th*, 1856.)

2081. Paul Frederick Wohlgemuth. The construction of bridges.

2093. Uriah Scott. Certain improvements in the construction of vehicles and the various parts of the same.

2112. Louis Cornides. Certain improvements in obtaining impressions of prints or drawings, and in transferring, printing and colouring, or ornamenting the same on glass or other surfaces.

2114. Samuel Coulson. Improvement in the manufacture of ornamented metal tea-pots, coffee-pots, milk-jugs, and sugar-basins.

2121. Asa Lees. Certain improvements in looms for weaving.

2122. John Dale. Certain improvements in appropriating waste products arising in the manufacture of certain chemical compounds.

2125. William Pollitt and James Eastwood. Improvements in apparatus for churning milk and mixing liquid compounds.

2131. Henry James Harcourt. Certain improvements in bell-cranks and other parts of bell furniture.

2138. William Wright and John Wright. Improvements in machinery for crushing grain.

2142. Frederic Rainford Ensor. Improvements in bobbin net or twist lace machines.

2144. Gustavus Huguenin. Certain improvements in watches and other time-keepers.

2146. John Norbury. Certain improvements in machinery or apparatus applicable to hydraulic presses.

2148. James Nasmyth. Improvements in the modes of obtaining motive power by a rotary or circular movement, and of applying it.

2155. François Xavier Poignand. Improvements in the manufacture of wedges and keys. A communication.

2162. John Talbot Pitman. An improved screw-wrench. A communication.

2170. Henry Bernoulli Barlow. Improvements in mules and other machines of the like nature for spinning and doubling cotton, and other fibrous materials. A communication.

2214. John Lancaster. An improved waterproof material.

2260. John Onions. A certain mode of collecting and means of applying for use the smoke, heated air, and other gases arising from engine and other furnace fires.

2282. Thomas Moore. An improved mill for grinding corn and other grain.

2309. William Cotton. Improvements in the manufacture of looped fabrics.

2312. John Forrest. An improved mode of extracting metals from their ores.

2375. James Smith. Improvements in apparatus for giving alarm-signals, and for extinguishing fires.

2639. Charles May and Paul Prince. Improvements in the manufacture of spikes and trenails

2739. William Henry Smith. An improved con-

struction of fastening, applicable to gaiters, stays, and other like articles.

2743. William George Wilson. A pneumatic moderator.

2768. Henry Bessemer. Improvements in the manufacture of iron.

2853. William Hemsley. An improvement in the manufacture of elastic pile fabrics.

2856. Andrew Small. Improvements in marine compasses, and in apparatus applicable thereto.

2861. Christopher Nickels and James Hobson. Improvements in the manufacture of pile fabrics.

2885. Alexander Charles Louis Devaux. Improved machinery for crushing and grinding vegetable and other substances.

2903. William Stevenson and William Crawford. Improvements in machinery or apparatus for carding or preparing fibrous materials.

2915. George Lean and Robert Thomson. Improvements in weaving.

2921. Frank Clarke Hills. Improvements in economising fuel.

2925. Charles May and Edward Alfred Cowper. Improvements in combing wool and other fibrous substances, and in machinery for that purpose.

2927. Edward Alfred Cowper. Improvements in combing wool and other fibrous substances, and in machinery for that purpose.

2929. Nicholas Douglass. Improvements in the construction of lighthouses, beacons, piers, and other similar erections.

2931. James Edgar Cook. An improved composition for preserving exposed surfaces, or surfaces liable to deterioration and decay.

2947. William Brown. Improvements in cooking and culinary vessels and utensils, and in the application and conveyance of heat.

2955. James Taylor. Improvements in apparatus for raising and lowering weights.

2957. James Cochran Stevenson and John Williamson. Improvements in the manufacture of soda and alkali.

11. George Hamilton. Improvements in apparatus for weighing.

15. Charles Toye. Improvements in weaving terry fabrics.

27. John Fowler, jun. Improvements in machinery for giving motion to ploughs and other implements used for cultivating land.

30. Henry Bach. Improvements in the application of glass to decorative purposes.

31. Charles Hart. Improvements in portable steam-engines, and in apparatus connected therewith, for tilling and cultivating land.

32. William Simmons. An improved hat body.

44. Henry Bessemer. Improvements in the manufacture of iron and steel.

50. Conrad Abben Hanson and John Wormald. Improvements in signal and other lamps.

64. Samuel Middleton. An improvement in the leather-covered rollers used in spinning-machinery.

120. John Fowler, jun. Improvements in machinery for ploughing land.

122. Henry R. Worthington. A machine for measuring the flow of liquids, called a fluid meter.

160. John Wordsworth Robson. Improvements in machinery appertaining to water-closets and pumps.

170. Dundas Smith Porteous. A rotatory engine.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

167. John Medworth and Lawrence Lee.
169. Peter Hubert Desvignes and Francis Xavier Kukla.
177. Charles Randolph and John Elder.
197. Nicholas Francisque Ador.
200. John Henry Johnson.
212. Robert Shaw.
216. George Edmond Donisthorpe and John Crofts.
217. James Pole Kingston.
218. Thomas Symes Prideaux.
219. John Scott Russell.
255. Edmund Leach.
272. Joshua Murgatroyd.
316. Richard Prosser.
341. Henry Pooley.

LIST OF SEALED PATENTS.

Sealed January 22, 1856.

1690. Vincent Scully and Bennett Johns Heywood.
1693. Christian Schiele.
1706. William Allen.
1708. John Aaron Benfield.
1712. John Whitehead, junior, and Robert Kay Whitehead.
1747. Alexander Allan.
1767. Robert Richardson and Walter Greenshields.
1821. Edwin Ullmer and William Ullmer.
1837. Thomas Butler.
1972. Robert Walter Winfield and John Jackson.
2032. Robert Barnard Feather.
2147. Felix Bouchet.
2236. James Washington.
2439. William Taylor.
2459. James Pattison.
2465. Thomas Ridgway Bridson.
2470. George Collier.
2485. Alfred Vincent Newton.
2486. Alexander Charles Louis Devaux.
2510. Thomas Godding.
2583. George Tomlinson Bousfield.
2529. William Henry Bentley.
2623. Alexander Tolhausen.
2654. Hiram Hyde.
2668. Hiram Hyde.
2676. John Henry Johnson.

Sealed January 25, 1856

1692. David Davies.
1695. James Beattie.
1707. Charles Hodges.
1710. William Bridgewater
1711. Charles Felton Kirkman.

1715. Charles Emile Paris.
1727. Joseph Marie Fillier.
1740. Bashley Britten.
1781. Henri Auguste Pradel.
1801. Edward Cooke.
1817. John Lee Stevens.
1825. James Gardner.
1835. Ebenezer Daggett Draper and George Draper.
1841. Gilbert Sanders and Richard Edward Donovan.
1850. Alfred Vincent Newton.
1856. Joachim Hayward Stocqueler and William James Buchanan Saunders.
1941. William Johnson.
2009. George Collier.
2119. John Page and William Robertson.
2239. William Rogers.
2349. William Field and Edward Jeffreys.
2359. Alexander Parkes.
2377. Jacques Rives.
2427. Henry Edwin Drayson.
2484. Thomas Thomas, junior.
2526. Charles Joseph Hampton.
2535. William Crosley.
2566. Cyprien Marie Tessié du Motay.
2606. Jeanne Barbe Ve Lopez.
2658. Enoch Harrison and Hilton Greaves.
2718. Westley Richards and Joseph Rock Cooper.

Sealed January 29, 1856.

1735. Nehemiah Brough.
1736. Hall Colby.
1758. Jean Baptiste Mourguet.
1777. John Avery.
1800. Victor Delperdange.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

CONTENTS OF THIS NUMBER.

Aldridge's Patent Fluid Meters and Taps—(*with engravings*) ... 97
Faraday's Experimental Researches in Electricity—(*Continued from page* 56) ... 99
The Wages of Artizans in the Royal Dockyards ... 103
On the Past and Present Condition of the River Thames ... 104
A New Cement as Hard as Marble ... 105
The Late Paris Exhibition ... 105
Proposed Scientific College at Newcastle-upon-Tyne ... 106
The Smoke Question ... 106
The Screw-Propeller ... 106
"Useful Information for Engineers." By W. Fairbairn, F.R.S., &c.—(*Review*) ... 106
Recommendations for the Prevention of the Smoke Nuisance. By W. Fairbairn, F.R.S., &c. ... 108
High Pressure Steam. By W. Fairbairn, F.R.S., &c. ... 108
Smokeless Furnaces ... 109
The Caloric Engine ... 110
Phillips' Funeral Carriage ... 111
On the Form of the Moon ... 111

Specifications of Patents recently Filed:

Walker	Ploughs	111
Raywood	Railway Breaks	111
Moreau-Darluc	Separating Substances	111
Symons	Steam-Engines	111
Davey	Safety Fuses	112
Engstrom	Breech-loading Ordnance	112
Besley	New Type Metal	112
Skelley	Carriage Wheels	112
Bellford	Gas	112
Hughes	Madder, Munjeet, &c.	112
Lorenzi	Organs	113
Dembinski	Generating Steam	113
Eccles	Bricks and Tiles	113
Weems	Drying Grain	113
Woodcock	Bricks, &c.	113
Barling	Furnaces	113
Birch	Iron	113
Tooth	Bricks, &c.	113
Lycett	Gloves	114
Mackelt	Engraving	114
Guillaume	Cranks	114

Provisional Specifications not proceeded with:

Russell	Hanging Windows	114
Lucas	Iron	114
Lilley	Water-Meters	114
Fontainemoreau	Axle-Boxes	114
Busson	Toothed Cylinders	114
Broadbent and Youle	Umbrella Gores	114
Heaps	Cultivating Land	115
Johnson	Manures	115
Mignon	Maps and Charts	115
Knapton	Furnaces	115
Hammant	Condensing Smoke	115

Provisional Protections ... 115
Patents Applied for with Complete Specifications ... 118
Notice of Application for Prolongation of Patent ... 118
Notice of Application for Leave to File Disclaimer ... 118
Notices of Intention to Proceed ... 118
Patents on which the Third Year's Stamp Duty has been Paid ... 119
List of Sealed Patents ... 119

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1696.] SATURDAY, FEBRUARY 9, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

MORTON AND HUNT'S PARALLEL-ACTION Z-CRANK MARINE ENGINES.

Fig. 3. Fig. 1.

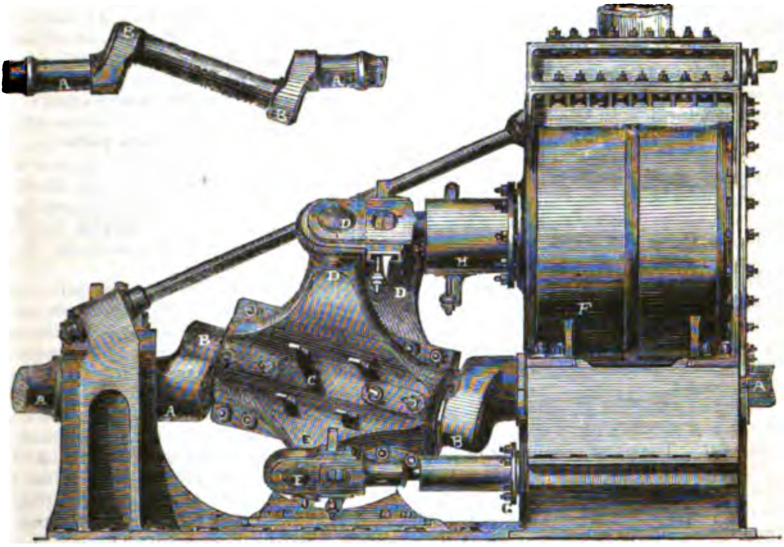
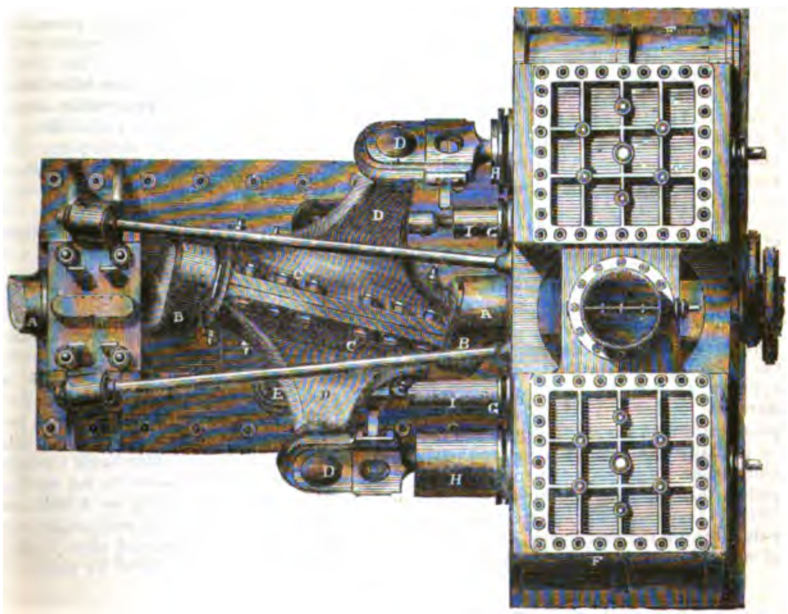


Fig. 2.



MORTON AND HUNT'S PARALLEL-ACTION Z-CRANK MARINE ENGINES.

(Patent dated June 5, 1855.)

An entirely novel description of direct-action marine steam engine, to which the above designation has been applied, and the merits of which have excited considerable discussion in the north, has recently been introduced by Messrs. Morton and Hunt, of Glasgow. The principal objects of the inventors in designing this engine may be gathered from the following extract from a communication they have forwarded to us.

"The vast number of designs for marine engines which have from time to time made their appearance, bear strong testimony to the importance which is attached, on all hands, to compactness of arrangement; but whilst aiming at compactness, we must not lose sight of simplicity and convenience, with easy accessibility of all parts requiring attention and repairs; and though there are many designs in existence which really possess some claims to compactness, still, in almost every instance, this is only obtained at the expense of serious defects. It is in engines for driving the screw propeller, and more particularly in those of the direct-acting class, that the most compact arrangements are to be met with; but in all these engines the steam cylinders are placed at right angles to the shaft—an arrangement involving, not so much a loss of space, as a most inconvenient disposition of it, since either a great width is taken up across the vessel, or a considerable height is required above the shaft. In addition, the transverse or vertical movement of the pistons and other heavy details tends greatly to shake the vessel."

In these engines, the cylinders are placed with their axes parallel to the propeller shaft, and their pistons work out longitudinally as regards the vessel. The cylinders are at the same time placed as close as is convenient to the shaft, and the additional space taken up by the details which communicate the motion to the latter, is scarcely more than equal to the length of the piston's stroke, so that it is hardly possible to conceive a more compact arrangement.

Of the engravings on the preceding page, fig. 1 is a side elevation; and fig. 2 is a plan of the new engine; fig. 3 is a plan on a smaller scale of the crank shaft, as detached and lying flat. The chief peculiarity of the arrangement is the form of the shaft. This shaft, which is marked A, has two cranks, B, forged upon it, nearly at right angles to its axis, and the elongated journal, or portion of the shaft which lies between and connects them, is inclined to, and crosses the axis of the shaft in such manner that the cranks, B, stand out from diametrically opposite points of the shaft, the whole being termed a Z-crank from its zigzag form. This crank serves for both cylinders and both air-pumps, and would serve for several more cylinders, were these arranged round the line of the shaft, either along with or opposite to the cylinders shown; and it is forged in a single solid piece, being obviously much less costly than a shaft with two double cranks at right angles to each other, which is required for any ordinary arrangement of engines. Upon the inclined cross-piece of the Z-crank is placed a lever-piece, consisting of an elongated tubular boss, C, fitted with brasses, to work loosely upon the cross-piece, and having four arms or levers, D, D, E, E, standing out at right angles to the cross-piece and to each other. The lever-piece is cast in two halves, which are bolted together upon the cross-piece of the crank by strong flanges. The two upper and longer arms, D, are connected by ball-and-socket joints to the connecting rods of the two steam cylinders, F, whilst the lower and shorter arms, E, are similarly jointed to the connecting rods of the air-pumps, G. The steam pistons are fitted with small trunks, H, to allow of the very slight lateral movements of the connecting rods, which are connected to the piston by ball-and-socket joints. The air-pump pistons are similarly furnished with trunks, I, for a like purpose.

In explaining the peculiar but simple motion involved in these engines, we will suppose the Z-crank to be as represented in the figures, with the two cranks, B, inclined at an angle of 45° to the horizon. In this position, the outer crank, B, is turned up towards the port steam cylinder; the opposite crank, B, being, of course, turned down. This throws the corresponding arm, D, of the lever-piece over as close as it can go to the port cylinder, F, and the piston of this last is at the inner end of its stroke. As regards the starboard cylinder, F, the Z-crank lies with its cranks, B, at right angles to the plane passing through the shaft, A, and through the axis of the cylinder, and the arm, D, stands up in that plane at right angles to the shaft, A, the piston of the cylinder being exactly at half stroke. In this position, if steam is admitted so as to drive outwards the starboard piston, this piston will have full power, through the lever-piece acting as a bell-crank lever, to turn down the outer crank, B, and lift up the inner crank. As soon as the steam enters behind the port piston, this piston begins to help the other one, and when a quarter of a revolution has been made, the starboard piston will be at the end of its stroke out-

wards, the port piston will be at half stroke, and the crank will be in exactly the same position as regards the port piston, as it was as regards the starboard piston at first, and the port piston will have full power on the crank to continue its revolution. Then, as the port piston gets towards the end of its stroke outwards, the starboard piston will be returning, and will bring round the crank, which will have passed its dead centre as regards this piston, and thus the motions of the two pistons will be combined, one being at the most effective part of its stroke whilst the other is on the dead centre, as in common engines, where two steam pistons are connected to cranks at right angles to each other. The Z-crank is prevented from carrying the lever-piece bodily round, by means of a pin, J, projecting downwards from the lever-piece, and working in a segmental grooved guide, K. The rotation of the Z-crank causes the ends of the lever-piece arms to reciprocate longitudinally as regards the shaft, A, and the lower arms, E, consequently work the air-pump pistons in and out. As these arms, E, are scarcely more than half the length of the upper arms, D, the stroke of the air-pump piston is considerably less than that of the steam piston, so that the speed at which the air-pumps are worked is comparatively low, the advantage of which is well understood.

The arrangement of these engines is extremely convenient, the steam cylinders, F, being placed upon the tops of their condensers, and above their air-pumps, whilst the whole is combined together into a simple and compact framing. The shaft, A, is carried in a strong outer pedestal bearing, which is connected to the condensers by a sole plate, and to the cylinders by two strong stays. The other end of the shaft is carried in bearings between the cylinders and air-pumps, and projects slightly behind the cylinders to carry eccentrics for working the valves and feed and bilge pumps. According to one arrangement, the valves may be worked by two eccentrics, one for the forward, and the other for the backward motion, the link reversing gear being used. Each eccentric has two rods, and, when acting, works two sliding blocks, which actuate rocking shafts for working the valve rods. The valve casings are placed on the tops of the steam cylinders, and the valve rods work out at the back. The feed and bilge pumps may be worked by an eccentric on the end of the shaft. The valves and feed and bilge pumps may, however, be arranged and worked in various ways besides those indicated. Thus, for example, the pumps may be conveniently worked by the lever-piece; and, in fact, the engineer may place these minor details where he likes, as the design of the engines affords peculiar facilities for communicating the requisite motion in any way that may be desired.

The Z-crank and lever-piece form the principal features of the design, the other details being susceptible of considerable modification. Thus, three or more steam cylinders may be placed round the shaft, or the power of the engines may be doubled at the expense of only half as much space in addition, by placing another set of cylinders, condensers, and air-pumps directly in front of those shown in the figures, and working upon the same lever-piece from the opposite direction. Or the steam cylinders may be of different sizes, so as to act on the combined high-pressure and condensing system. The propeller shaft may be continued in either direction from the engines, and the Z-crank being of such a strong form, the thrust of the propeller may be received through it, and on the extreme end of the shaft, if desired. The shaft is low down, and on account of the peculiar form of the space taken up by the engines, they can be placed as far aft in the vessel as is convenient; or, if the engines are placed at the wider part of the vessel, sufficient space for coal-bunkers will then be left between them and the sides of the vessel.

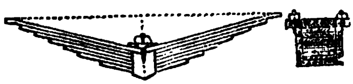
If these engines are compared with common engines of equal power, the great saving in space will be at once apparent; whilst, however, the compactness of the arrangement is incontestible, this quality is not accompanied by any complexity of parts. There is no part about the engines requiring attention, or at all likely to need repairs, which cannot be got at with the greatest facility. Finally, the shaft is self-balanced, owing to the peculiar form of the crank, and can consequently be driven at a higher speed than common engines, in which the heavy unbalanced cranks make the motion irregular; and, in fact, the whole arrangement of the engines is such as to reduce the vibration of the moving parts to a minimum. A working model of these engines has been made to run at the rate of 1,800 revolutions per minute, with 35 pounds upon the boiler safety-valve. The model has two cylinders, 1½ inch stroke, 2¼ inch diameter, the speed of the pistons being 450 feet per minute. The moving parts seem capable of running, with ease and coolness, even faster than at the rate mentioned, but the steam has evidently not time to enter and return through the ports and passages more than 3,600 times per minute, as it does to give that rate.

ADAMS' IMPROVED SPRING AND AXLE-BOX FOR RAILWAY CARRIAGES.

A paper descriptive of an improved spring and axle-box for railway carriages was recently read at the Institution of Mechanical Engineers, Birmingham, by Mr. W. Bridges Adams, of London, the inventor.

In the improved spring the plates are made in an angle shape, as shown in fig. 1,

Fig. 1. Fig. 2.



and the specimens exhibited, being formed in two straight or nearly straight lines, rising from the centre, instead of the usual curve. The spring is therefore very firm at the centre in the direction of the strain, whilst the taper points, on the contrary, are disposed to yield equally and easily, forming as they descend, two gradually increasing curves, diminishing the actual span of the spring, and consequently diminishing the leverage and increasing the power of resistance.

In the construction of the ordinary laminated springs with flat or slightly curved centres, it is necessary to resort to some method of keeping the several plates central and parallel. This is done either by a bolt passing through the whole of the plates in the centre, or by forming them with a series of studs by indenting the plates at the centre, and clipping the whole together. Either method tends to weaken the plates at the centre, and to break them if the fastenings get loose. To keep the plates parallel, the ends are indented to form studs which work in elongated slots in the plate below, one plate keeping another parallel. But in the mode of ordinary work, these are very inefficient, and if the plates are not well fitted they work askew.

In the improved spring, the centres of the plates are all creased to exactly the same angle, and thus lie one within another without any tendency to curve lengthwise, each one lying in the valley below it. A clip, or a pair of coupling plates with bolts outside, shown in section in fig. 2, holds all the plates together, and the angle form retains them so firmly that all slots and studs at the extremities of the plates can be dispensed with.

In the ordinary spring, the ends of the plates are tapered in width. Originally they were tapered in thickness, but the late Mr. Chapman tried, and successfully, the experiment of tapering in width for private carriages. The length of taper he used was four times the width of the plates. When introduced on railways, the desire to save steel gradually reduced the taper to one width, and sometimes to half a width. It has even been proposed to carry the saving of steel to the uttermost, by cutting one plate out of the other with a one-sided taper; but the writer is not aware that this plan was ever adopted, and it is evident that it would tend to push the plates sideways.

In experimenting with the improved spring, the writer found that tapering in thickness caused considerable friction between the plates, by the ends binding against the hollows of the curves, and the tapering in width caused an irregular action. The method was therefore tried of simply cutting the plates off square, slightly rounding the upper edge. This was found to give the most perfect elastic action, and without any waste of steel.

In making ordinary springs it is customary to make the top or back plate of a given curvature, and to increase the curvature of every succeeding plate, afterwards compressing the whole together and fastening by the central bolt or clip. This plan renders the springs uncertain as to strength, and the hammering or setting, denting the surface of the plates, is very apt to cause fractures.

In the improved springs, the plates are all creased to the same angle by a pressing machine, and any plate will fit any other plate without any setting up. They can therefore be kept in duplicate, and in case of breakage a common labourer can apply a new plate, without needing a smith and spring fire. Thus the improved spring wastes no steel, has no holes, no slots or studs, and no taper; it is nearly machine-made, and therefore more skilful workmen can be afforded for hardening and tempering; no files or expensive tools are required; and extra plates may be applied for greater loads by merely lengthening the bolts at the centre, and the springs may be made either with rolled eyes or plain ends as usual.

The action of this spring may be reversed by placing the short plates in the hollow side, suspending the ends, and carrying the load in the centre.

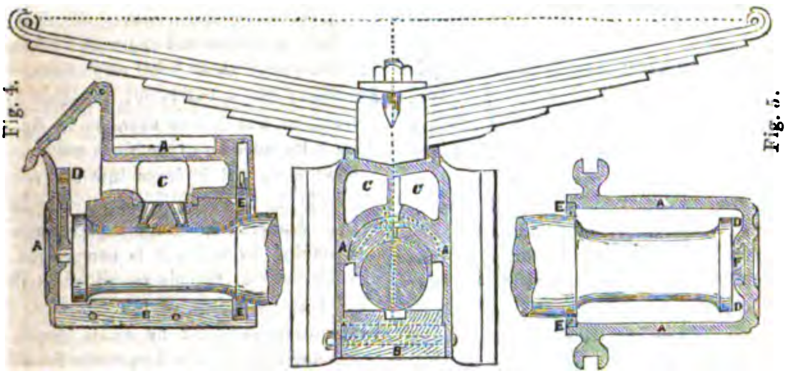
The central angle may be either a sharp angle or a slight curve, but the sharp angle is preferable. If the curve be used, more care will be required in fitting, as it is evident that the sharp angle will, in case of slight inaccuracy, hold the plates firmest: any angle may be used which will keep the plates central by the pressure without studs or bolts.

The springs are applied in the axle boxes so that the hoop or clip lies in a hollow, as shown in fig. 3, and no other fastening is required. This is very important, as, when

the axle box is bolted to the spring, it is by inaccuracy frequently strained from its proper bed on the journal, and heating ensues, and continues till the bearing is worn down to a fit.

The axle box preferred by the writer is shown in figs. 3, 4 and 5. It is a single casting, A, with a thick wooden bottom, B, which is bolted in when placed on the journal. There is a grease or oil chamber, C,

Fig. 3.



with feed holes above the journal, communicating by a large opening, D, at the front of the axle box, with the grease or oil chamber below. The box is rendered tight so as to contain a well of oil or grease, by two half cast metal collars, E, at the back, the upper one supporting a spring that draws up the lower to clip the axle, which is formed to a conical shape at the back of the shoulder, so that the pressure of the spring always forces the collar down the cone and against the back of the box, but with a facility for a slight elastic yielding in case of any irregular resistance. It is obvious that as the collar slides up the cone, there will be a slight inaccuracy in the fit, but the wear will take place at the joint, where it is not important, and the lower half collar up to a sufficient height will always press close to the axle. In front of the box, and passing down the opening, D, inside, is a gun-metal slide, F, adapted for four changes, against which the end of the journal works, so that there is no need for any fit against the shoulder and collar, and the end wear of the brass is entirely prevented.

This box accordingly fulfils the several conditions required; namely, keeping the lower part of the axle in a bath of grease; saving the grease from waste; saving end wear of the brasses and oscillation of the carriage; diminishing the risk of heating by efficient ventilation; saving breakage of bottom castings; in case of heating, affording the facility of filling the box with water from above: saving the need of lifting the boxes, by allowing access below; and by reason of the absence of fastening, and the elasticity of the spring under all circumstances, diminishing the chance of heating.

The improved springs have been in use on the South Western Railway nearly six months, from the 5th of May last, and they have given every satisfaction. From an experiment made upon four springs on September 25th, it was found that two of them, after a pressure of three tons had been applied, set one-eighth of an inch, and the other two resumed their original shape. The experiment was made after they had been in use upwards of four months, and had run a distance of 2,434 miles under a heavy covered goods waggon; and previous to this working, they were also tested with the same weights without the least set being produced.

In point of first cost they are cheaper than the ordinary spring, inasmuch as a saving of 40 lbs. weight per set of four springs is effected, for a spring with eight plates on the new plan is quite equal to a spring with ten plates of the usual construction, the weight being 72 to 73 lbs. in the new, as against 84 lbs. in the old. The new springs are not so susceptible of derangement as the ordinary spring, and are more elastic and adapt themselves better to the loads; they are also less liable to break, and altogether form a simple and compact arrangement.

Mr. Adams exhibited several specimens of the improved spring, one of which was taken to pieces, and put together again; and also a specimen of the axle-box.

The Chairman (Mr. W. Fairbairn, F.R.S.) observed that the liability of the ordinary springs to a permanent set after wear was a great objection to them, and the comparative freedom from set of the new springs was an important consideration; also the simplicity of their form and make would be a practical recommendation.

JOY'S SPIRAL COIL PISTON PACKING.

An improved piston packing, of which a description was recently read at the Institution of Mechanical Engineers, Birmingham, was designed by Mr. David Joy, of Worcester, in order to carry out the principle which appears to him the correct one, for producing steam-tightness with the least loss of power from friction and the greatest economy in repairs; namely, by the use of metal in that form in which it will give out the greatest amount of continuous elasticity, that is, by employing a spring acting through a lengthened space with comparatively slight intensity of pressure, instead of the short and rigid spring or series of springs commonly used in packing metallic pistons.

The piston in which this packing is used is shown in figs. 1 and 2, and consists of a

Fig. 1.

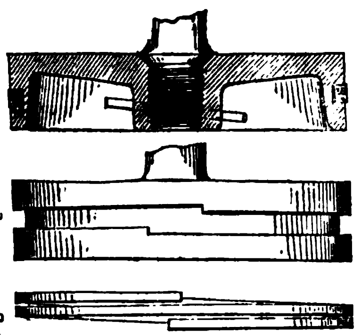


Fig. 2.

Fig. 3.

simple block, into which the rod is screwed and pinned. The periphery of the piston being turned to $\frac{1}{16}$th inch less diameter than the cylinder, a recess is cut in it with a $\frac{1}{2}$ inch tool set at $\frac{1}{2}$ inch pitch, making 3 inches more than 2 revolutions, as shown in fig. 2.

The packing is formed out of a broad cast-iron or brass ring, $\frac{5}{8}$ inch thick, and $\frac{3}{4}$ inch larger in diameter than the cylinder. The ring is turned and bored, and being placed on a mandrel, a spiral groove is cut in it with an $\frac{1}{8}$ inch tool, set at $\frac{5}{8}$ inch pitch, as shown by the dotted lines. This cut being carried through, leaves the ring in the form of a spiral coil of $\frac{1}{2}$ inch by $\frac{5}{8}$ inch section, and of about 5 full revolutions. A portion of this spiral is cut off, equal to 2 revolutions and $\frac{3}{4}$ inch over, as in fig. 3. This is threaded on to the block piston and pushed down till it drops into the recess shown in fig. 2, which it exactly fills laterally. A sheet iron cramp is placed round the packing, by which it is compressed to the diameter of the piston, which is then placed at the mouth of the cylinder, the ports being protected by small blocks of wood, and the piston is then thrust from the cramp into the cylinder.

The objects aimed at in this modification of packing, are, to avoid friction by obtaining an elasticity as light as possible, yet sufficient to produce perfect contact with the face of the cylinder, to ensure steam tightness, and sufficiently continuous to follow up the effects of wear without the necessity of frequent renewal by resetting. And this the inventor finds is best accomplished by using a packing which shall consist of the greatest possible length in proportion to its cross sectional area. No figure meets this requirement so fully as the spiral coil, and the number of coils or length of packing can be increased to any extent that may be found advantageous, the elastic action being always in one continuous length.

As the coil fits throughout its length between the parallel sides of the recess in the piston, its two extremities may recede from each other to any distance that may be found requisite for wearing out the rings without at any time exposing an opening for the passage of steam. The packing under all circumstances fills the recess except at the bottom, where the vacant spaces at the extremities of the ring, left in the uncoiling of the ring by wear, are effectually closed by the piston body sliding in contact with the cylinder, that part of the packing ring being placed at the bottom side of the piston for this purpose. By experiments it has been found that with the 16 inch brass packing with $\frac{1}{2}$ inch elasticity of compression on the diameter, and $\frac{1}{2}$ inch square sec-

tion of packing, the pressure on 53 square inches of surface of packing was 1·92 lbs. per square inch, or 102 lbs. on the whole packing. It took 65 lbs. to move this piston backwards and forwards in the cylinder when disconnected from the rest of the machinery and the glands unpacked, equal to 0·32, or about ⅓lb. per square inch on the surface of the piston. The 16 inch cast-iron packing with ⅜ inch elasticity of compression on the diameter, and ½ inch by ⅝ inch section of packing, gave a pressure of 4·41 lbs. per square inch of surface of packing, and took 135 lbs. to move it in the cylinder as above, being 0·67, or about ⅔ lb. per square inch on the piston. This experiment was made immediately after the engine had done her day's work, when the cylinder lids were taken off, and the glands unpacked for the purpose. Previously to unpacking the glands, the steam at 110 lbs. pressure was put on behind the pistons with a most satisfactory result, there being no appreciable leakage of steam past the piston. A similar trial has frequently been made by merely opening the cylinder cocks, and putting steam on behind the piston, when no appreciable blow is observable.

A corresponding experiment was also tried with a 16-inch piston of the ordinary class, having cast-iron V packings, and it was found to require 426 lbs. to draw the piston slowly along the cylinder, when disconnected as in the other experiment, showing more than three times the resistance.

The new packing avoids the frequent necessity for "looking at" the piston, which is so large an item in the expenditure of locomotive running sheds, and this is in a great measure a consequence of the accomplishment of the former object, as the large amount of elasticity resident in the coil will wear out the packing without the necessity of examination for renewing that elasticity by means of resetting the springs, as in ordinary pistons.

This piston has also the advantages of simplicity of construction and freedom from parts liable to get loose and produce breakage of pistons and cylinders. As this packing is used in a block piston, it does away with the necessity for lids, nuts, screws, guards, &c., and reduces the piston to its fewest possible number of parts, the rod, the piston, and the split pin to secure the rod to the piston. The packing ring also being always confined in a recess of a cross section exactly equal to its own, if broken can produce no injurious effect, as it must always remain in its place as if whole. The time required for removing the packings is very short, the cylinder lid being taken off and the cross head cotter knocked out; the piston is then drawn out, when the old packing is threaded off the piston and a new one threaded on in ten minutes, and the piston replaced. From the long-enduring elasticity of the coils, they are expected to last without examination at least 15,000 miles, the only need for examination being for the purpose of cleaning. There has not yet been time actually to wear out a ring, but as data upon which to form an approximate opinion, the ring marked No. 2, which is exhibited, has run more than 10,000 miles, and when taken out did not blow.

The new packing is also attended with economy in original cost, as the expense of piston and packing shows a considerable reduction on those generally in use.

MARSDEN'S SYSTEM OF VENTILATION FOR SEWERS, MINES, ETC.

Mr. Marsden, of Gracechurch-street, London, whose ventilators for military and other tents were described and mentioned favourably at page 413 of our last volume

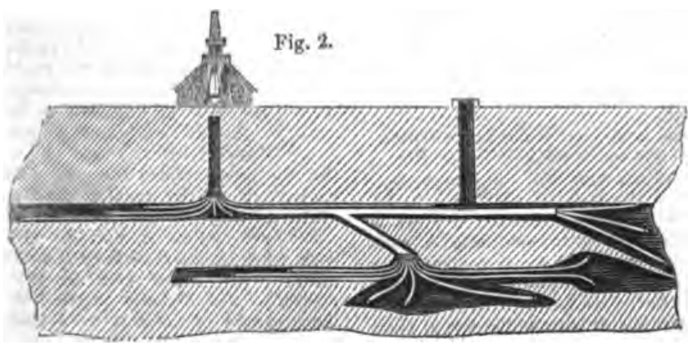


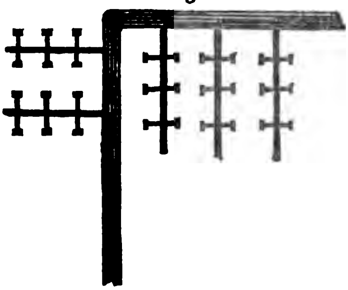
Fig. 2.

(No. 1682), has recently introduced a plan for ventilating sewers, mines, tunnels, &c., to which he attaches great importance. The main feature of this plan (which the

inventor denominates, "the Artery and Vein 'System of Ventilation") consists in furnishing the place to be ventilated with a system of pipes of different lengths, placed side by side, and connected with a fan or other exhausting or forcing apparatus. The object of having the pipes of various lengths is, that by their opening into the sewer, mine, or tunnel, as the case may be, in as many different positions as may be necessary, the whole of the foul gases may be drawn or forced away, with a facility which would be impossible under other circumstances.

Fig. 1 of the accompanying engravings represents the sewers of two principal

Fig. 1.



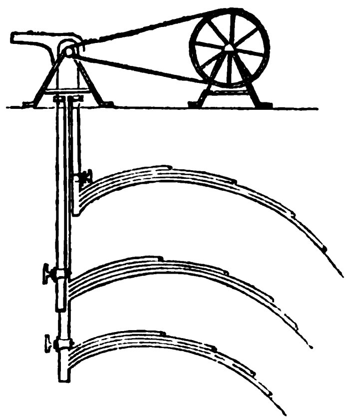
streets, and of several smaller ones which lead into them. It will be seen that one of the ventilating pipes is ended opposite to each of the inner sewers, for the ventilation of which it is designed. It is obvious also, that the ventilating pipes of any convenient number of streets may be brought together and led to one fan. As our object at present is simply to lay the characteristic features of the invention before our readers, it is not necessary to describe minutely the minor details connected with it.

Fig. 2 represents the manner in which the plan is applied to the ventilation of mines. In this application of it, it would be necessary to employ flexible pipes in order that their extremities might be carried into the various branches and recesses of the mines, the ventilation of which was to be effected.

The plan is also applicable to the ventilation of public and other buildings. Fig. 3 exhibits an arrangement sketched by Mr. Marsden to illustrate its adaptation to the galleries of a theatre. One set of pipes is intended to serve for the ventilation of each gallery, and the whole are to communicate with a single fan placed in any suitable position. Cocks are provided, in order that, if desirable, one or more of the sets of pipes might have its communication with the fan cut off.

Mr. Marsden also claims for this invention a peculiar applicability to the ventilation of long and close tunnels, particularly

Fig. 3.



to the contemplated submarine tunnel, by which land communication between England and the Continent is to be effected.

SIR JOSEPH PAXTON ON THE SURPLUS FROM THE PATENT OFFICE FEES.

The following letter, from Sir Joseph Paxton, M.P., was recently laid before the Council of the Society of Arts, and published last week in the Society's *Journal*. The subject of it is a most important one, and we quite agree with Sir Joseph in believing that it is highly desirable that the proceeds of the Patent Office should be withdrawn from the Exchequer, and appropriated to the development of improvements, which will facilitate the spread of information essential to inventors. Great facilities have already been afforded by the arrangements recently sanctioned by the Commissioners, and very ably prosecuted by Mr. Woodcroft, and the advantages derived from them have been so manifest as to give great weight to the suggestions contained in Sir Joseph's letter. It is to be hoped that the contemplated change in the appropriation of the surplus fund will be made speedily, so that the improvements which will follow it may be proceeded with, while we have, in the Patent Department, "the right men in the right places." The Council resolved that the letter should be referred to a Committee to consider and report thereon.

Rockhills, Sydenham, 3rd January, 1856.

Sir,—As a Vice-President of the So-

ciety of Arts, permit me to invite the attention of the Council to the large and constantly increasing revenues derived from the fees paid by inventors for letters patent, and to the mode in which they continue to be misappropriated. It will be recollected that at the last annual dinner of the Society, I referred to this important subject, and I now revive it, because I think that the time has come when it is necessary to take active steps in the matter. The Council is aware that after paying all expenses and fees connected with letters patent, a very large annual surplus arises, which, according to the present arrangement, will be absorbed by the Treasury. According to the Report of the Commissioners there were, in 1854, 2,764 patents applied for, and 1,912 sealed, the fees and payments thereon amounting to £53,000. After deducting from this total £8,600 for the law officers of the Crown and their clerks, £4,500 as compensation for abolished offices, £3,600 for salaries, &c., in the Patent Office, £4,400 for rent, stationery, &c., and £16,300 as the balance due from the previous year on an extraordinary outlay of £42,000 on the printing of specifications, after, I say, deducting these sums, there still remained a surplus of £15,600.

Now take this present year—of course the Commissioners' report upon its results has not yet appeared, but we know that the total amount of fees payable for patents will be greatly increased—the applications will be about 3,000 in number; and, allowing for a proportion not proceeded with, the total payments may be computed at £60,000.

Then, bear in mind that, although under the new law the first cost of a patent is only about £25; to maintain it, £50 must be paid at the end of the third year, and £100 at the end of the seventh year. The payments to be made on patents granted in 1852 are now falling due; and calculating that 700, or about one-third of the original number, are considered worth maintaining beyond the third year, there will accrue in this way, during the present year, an increased revenue of £35,000. Again, supposing that 300, or rather less than half of these, are allowed to lapse at the end of the seventh year, for the 400 that remain there will be a further increase in 1859 of £40,000 per annum. Thus, then, without calculating on any probable future increase in the number of patents granted, we seem fairly entitled to estimate the prospective gross revenue from inventors at £95,000 until 1859, and £135,000 afterwards.

This is so enormous a tax upon the ingenuity of the country, the last thing which ought to be oppressed by fiscal restrictions, that in my opinion the attention of your Society, and of patentees generally, should be at once drawn to it, in order to procure a great diminution in the scale of charges for securing patent rights. But even if it is considered that the present scale is not burdensome to individuals, or injurious to the general progress of invention, I submit that there is wide scope for amendment in obtaining such an appropriation of the large surplus which must remain, after deducting all expenses, as will preserve it for the benefit of inventive genius throughout the country, and prevent its being absorbed by the Treasury. In order to bring out this point more clearly, let us suppose that the gross revenue of the Patent Office is accurately estimated at £95,000 till 1859, and at £135,000 from that date.

Taking the accounts of the Commissioners for 1854, it will not be difficult to deduce from thence the probable expenditure, so as to estimate what the net surplus is likely to be. Reckoning the number of patents applied for at 3,000, and the payments computed as above at £60,000, the fees to law officers of the Crown and their clerks would amount to something like £10,000, the salaries of all the officers and clerks in the Patent Office to £4,500, the compensation for offices abolished to £4,500, and the expenses of printing specifications, &c., to £12,000. This makes a total expenditure of £35,000, leaving upon the estimated gross rental of £95,000, as already stated, an annual surplus of £60,000, which will rise to £100,000 in 1859.

Supposing, for a moment, the foregoing estimate of expenditure and surplus to be taken as it stands, it never could have been intended by the legislature that a direct tax of £100,000 per annum, or even £60,000 per annum, should be imposed upon patentees for the general purposes of the State. A tax to defray the cost of the Patent Office, and give it any amount of increase desirable for the progress of invention, everybody would comprehend; but to place pecuniary obstacles of an unnecessary and burdensome character in the path of discovery and improvement, already sufficiently strewed with difficulties, is, upon the very face of it, an unspeakable folly. The title of our Society, assigned to it by charter, has ceased to be appropriate; and the arts, manufactures, and commerce of the country have long since assumed dimensions which enable them to dispense with "encouragement" from any body of men, however zealous, enlightened, or influential. But it does appear to me that we can still do much good, by concentrating attention and bringing opinion to bear powerfully

upon such questions as that which I am now endeavouring to place before the Council. I consider that the Society of Arts is bound to exert itself in rescuing this annual surplus from the hands of the Treasury, and I will endeavour to point out, not only how, in my opinion, the money should be applied, but how the Council should proceed in the matter, if they concur in my views. Before, however, doing so, it is requisite to point out that the charge upon inventors for securing their patent rights should not exceed what is requisite for maintaining the Patent Office in such a state of efficiency as to make it worthy of this country, and to get out of it the utmost possible amount of benefit for those who devote themselves to scientific and practical discovery. I cannot bring myself to think that so large a sum as £100,000, or even £60,000 per annum, of clear surplus, is at all necessary in addition to its present working expenses, in order to give the Patent Office its proper development. Therefore it follows that a very considerable reduction can be effected in the present scale of charges upon patentees.

It is only recently that any serious and worthy efforts have been made to introduce something like order and classification into the Records of the Patent Office, to prepare a good and accurate series of indexes and other facilities for reference and consultation, to open up relations with similar establishments in other countries, to form an industrial library, and to provide at convenient points, not only throughout the United Kingdom, but in the colonies, the means for enabling every man who thinks that he has made a useful discovery, to ascertain whether it really possesses the novelty which constitutes claim to the exclusive use of it for a limited number of years. Through the liberal interpretation of their duties by the Patent Commissioners, and the valuable labours of Mr. Bennett Woodcroft, their superintendent of specifications, the foundations have been laid for the accomplishment of these objects; and it is obvious that they come fairly within the scope of what persons seeking patent rights may be expected and asked to pay for. I contend, indeed, that much wider ground should be taken than is at present occupied in this way, and that it is disgraceful to us, as a nation, dependent upon our industry and skill for our power, that we should have nothing better to show as the head quarters of British invention than the establishment in Chancery-lane. In an age which boasts that, beyond all others, it desires to recognise and do honour to the peaceful arts, can we justify to ourselves the indifference which we have shown to the reputation and fortunes of our great discoverers, men who have conferred more lasting benefits upon their kind than kings or conquerors? I should like to see the Patent Office a place where such interests might be suitably conserved, where the original models of inventions like Symington's steam engine might be collected, and where our posterity might trace in a great gallery the outward forms and lineaments of those master minds upon whose labours the vast fabric of modern industry mainly rests.

It appears to me, that the body in the Council of which the scheme of the Great Exhibition of 1851 originated and was elaborated, is better fitted than any other to bring to bear upon the Commissioners of Patents, upon the Government, and on the Legislature, such a pressure of influential opinion as shall compel the adoption of those improvements which I have thus indicated in general terms. I have merely sought to open up the subject; to point out the danger of the Treasury acquiring a vested interest in a surplus revenue more than sufficient for the great objects of enabling invention to take its flights from the furthest verge of realized discovery, and of securing to it those hardly-earned rights of which it has hitherto been so remorselessly plundered on every hand. It has long been the custom of eminent men to complain of the want of State encouragement, but here will be their true endowment—one resting on the strong basis of public utility, and which all who really deserve it may enjoy without any sacrifice of independence on the one side, or any chance of favouritism on the other. Supposing the Council to concur in the views which I have advanced, I would leave it to them to consider how best they can bring the influence of the Society to bear in accomplishing the objects sought for. It seems, however, to me, that they might take steps to bring together as large a number as possible of the patentees in London and the country, and concert with them what ought to be done. The Commissioners of Patents are entrusted by the legislature with large powers, and what is required is, to get them to use these powers as may be best for the interests of the patentees and the progress of inventions.

I have the honour to be,

Your obedient humble servant,

Joseph Paxton.

HOUSEHOLD FIRES.

HOW TO MAKE A FIRE IN A COMMON GRATE WHICH SHALL SAVE HALF THE COAL AND BURN THE SMOKE.

Clear out your grate: cover the bottom

with a sheet of paper, cut or folded to fit: place your coals in the grate to the level of the top bar, keeping the larger ones to the front to prevent waste. Light your fire on the top, and allow it to burn downwards undisturbed. An ordinary fire, prepared and lighted in this way, will, according to the size and form of the grate, burn six, eight, or ten hours without any renewal of coal, burning brighter and warmer than if lighted from below, as fires are ordinarily made.

The coal should be tolerably equal in size, something like Macadam stone: place the large to the front, the small to the back. The paper is put in the grate to prevent any air rising through the bottom bars. The fire is lighted on the top, and made to burn downwards, to prevent rapid combustion, and to keep the heat at the surface—the coals, "cinders," or "coke;" and, if undisturbed, the combustion will be so complete, that there will be no waste ashes.

The grate must be cleaned each morning, and the paper must be renewed on the bottom of the grate, as it is burned when the fire reaches the lower stratum of coal. The writer and his friends have made their fires, as described, for some weeks, and can vouch for the "saving of coal," the cheerfulness and warmth, and freedom from smoke. In principle, this mode of fire-making resembles that in Dr. Arnott's patent grate, which is fed from below: any smoke must ascend through the fire; and, in doing so, is burned. Some grates may present more difficulties than others, and servants object to the innovation. It is "*beggarly;*" it is "*mean;*" &c. My servants, now they have learned how to make such fires, approve of the plan, as "*the grates are not so dirty, nor so difficult to clean as formerly.*" Think of saving half the coal, and most of the smoke from the 300,000 house fires in the metropolis! This is a smoke-consuming feat worth advocating, and, with individual attention and care, may be accomplished. Kitchen fires must, I fear, be exceptional.—*The Builder.*

AMERICAN IMPROVED OSCILLATING ENGINES.

In the *Arago*, a fine new United States Mail Steamer, built by Westervell and Sons, of New York, Messrs. Stillman, Allen, and Co. have fitted a peculiar arrangement of oscillating engines, the first of the kind, which well merits the attention of our engineers. The cylinders stand nearly opposite each other fore and aft, inclining, when on their centres, towards a vertical line through centre of shaft, an angle of 24°. The usual centre shaft, centre shaft cranks, and centre shaft pillow blocks, are dispensed with, the arrangement affording means of connecting the engines at right angles by means of a simple union link, which is made of wrought iron and forged in one piece. As the link suffers only a tensile strain, it is considered safer than a centre shaft, which suffers both a torsional and transverse strain. The performance of the union link for two voyages is highly satisfactory. The steam and exhaust valves are of the usual double beat balance description; the valve chambers, induction and eduction pipes, are cast with the cylinder, thereby affording a very short and direct connection therewith. The rock shaft and valve gear combine the latest improvements, and are fitted with Allens and Wells' variable cut-off, which is adjustable for cutting off at different points of the stroke by the hand of the engineer while the engine is in motion. Each engine is provided with Pirsson's patent surface condenser, supplying 2,000 square feet of condensing surface. Tubes, of copper, 1 inch diameter.

In the *Journal of the Franklin Institute* for December last, Mr. E. W. Smith, engineer to the New York and Havre Steam Ship Company, makes the following remarks:—"Until late years, the oscillating engine was not considered so well adapted for ocean steam ships as the side lever, beam, and other stationary cylinder engines, extensively made in this country and Europe. The oscillators were considerably used in the latter place, but on comparatively a small scale, when they were invariably fitted with the slide, steam, and exhaust valve; and if a seperate expansion valve was introduced, it was generally the old-fashioned swing valve, inserted in the steam pipe *outside* the cylinder trunnion, which necessarily occasioned a great loss in the expansion of steam. Thus arranged, it could not compete in service for an equal amount of fuel, with similar size, stationary cylinder engines, having better valve arrangements.

"To American engineers, and chiefly to Horatio Allen, Esq., of the house of Stillman, Allen, and Co., belongs the credit of modifying and improving the oscillating engine, until it now combines the same fuel-saving appendages adapted to the best stationary cylinder marine engines, while its efficiency in other respects is unimpaired, and it may be considered a successful competitor with the side lever and other popular forms of engines.

"American engineers can also take to themselves the credit of having led the way in building the *largest* oscillating engines. Stillman, Allen, and Co., in 1851, built a

pair of oscillators for the steam ship *Golden Gate*, of 85 inches diameter of cylinder, and a stroke of 9 feet. In 1852, they constructed a single oscillator for the *John L. Stevens*, of 85 inch cylinder, 9 feet stroke; and the following year, one for the *Augusta*, of 85 inch cylinder, 8 feet stroke; then followed the *Knoxville* and the *Arago*, by the same builders.

"When it is considered that in the arrangement of the *Arago*, when compared with side lever double engines similar to those of the *Collins* and *Cunard* steamers, two steam cylinder cross heads, four cylinder side connecting links, four side levers, four cross tail links, two connecting rod cross tails, two connecting rods, two centre shaft cranks, one centre shaft, two centre shaft pillow blocks, in all *twenty-three parts* of what may be considered the *harness* between the power and resistance are dispensed with, and the piston rod attached directly to the crank pin, some idea of its simplicity may be conceived. The risk of breaking any *one* of the above enumerated twenty-three parts, which would disable the engine, is avoided. The union link, substituted to connect wheel cranks in place of centre shaft, is the only part *added* between the piston rod and paddle wheels, and is so simple of construction as to create no fears of its frailty.

"The cylinder trunnion, which some eminent engineers have considered a questionable feature of the oscillating engine, have invariably worked well, and I believe that none of the American engines have given difficulty from that source, there being no beam in the arrangement through which the power is transmitted, the pressure on the cylinder trunnions is only one-half what it would be on beam centre journals; the bearing surface of the trunnion journals must necessarily be large to give sufficient capacity of steam and exhaust opening; and, moreover, the current of steam constantly passing through the trunnions when the engine is in motion, tends to keep them at a temperature corresponding with that of the circulating steam and prevents them from accumulating heat of a higher degree."

ROLLASON'S IMPROVEMENTS IN PHOTOGRAPHY.

TRANSFERRING PHOTOGRAPHS—PREPARING SURFACES FOR RECEIVING PHOTOGRAPHIC PICTURES.

(Patent dated April 7, 1855.)

Mr. Alexander Rollason, of Birmingham, photographic artist, has recently effected an invention, which consists of improvements in transferring to paper, linen, card-board, bone, ivory, wood, metal, or stone, the film of collodion or albumen used in collodiotype or albumenized plates, by which he can either remove a photograph from the glass or plate on which it has been produced, or, by transferring the plain film on to certain of the substances above named, produce a new base or medium on which photographic pictures may be taken. Having thoroughly cleansed the glass plate, either with spirits of wine, naphtha, water, or tripoli, and finally buffed it with charcoal buff leather (which will have a slightly greasy surface, and is, on that account, the better for his purpose), he covers the glass with iodized collodion, or any other similar and suitable material on which a photograph can be taken, after which it is submitted to any of the well known processes for rendering the film sensitive, such as immersion in a bath of nitrate of silver, and is next placed in the camera, and a picture taken, which has then to be developed in the ordinary manner (that is, by washing with a solution of iron in nitric or glacial acetic acid), and afterwards fixed with a solution of cyanide of potassium or hyposulphate of soda, and having been well washed, it is allowed to dry (if necessary, by the application of gentle artificial heat). Should the collodion be of a very adhesive quality, it is sometimes essential before drying the picture, to immerse it for two or three seconds in a bath of very dilute nitric acid. So far, the operations of taking an ordinary photograph on collodion, or what is termed a collodiotype, have been described. The picture thus taken is next subjected to the improved means for removing or transferring the film from the glass. Having first ascertained that the picture is perfectly dry, the inventor proceeds to colour it, if it is intended to be coloured at the back, or on the film itself, in the following manner:—Employing oil or varnish, or well-sized water-colours, he tints the picture according to taste, and when it is dry covers the whole with any coloured varnish according to the general tint he wishes to produce. If it is not desired to colour the picture whilst on the glass, he covers it at once with varnish, for the components of which he prefers using asphaltum, or Brunswick black, dissolved in mineral naphtha to about the consistency of cream. Many other kinds of varnish will answer well, but this is the description found best suited for the purpose, in consequence of its drying quickly, and being more manageable than others. Its tone may be varied by the introduction of warmer or cooler colour, according to taste. When the varnish is so dry, that on drawing the finger across it no stickiness is detected it

is not desirable to let it dry beyond this point, lest it should be liable to crack; but should the operator be unable to proceed to the further operations at the time, to avoid its cracking, he coats the varnish with a thin solution of shellac in wood naphtha, or any other suitable solvent, which prevents the further hardening of the varnish.

The next proceeding is, to remove the film from the glass; having prepared a mucilage, which is by preference composed of gum arabic and honey, in the proportion of two-thirds of the former to one-third of the latter, the inventor covers the varnish with it; and if it be paper that is employed for the transfer, it may be necessary to damp it first and then coat it with the same mucilage. After attaching the paper or other flexible material to the back of the picture, an even adhesion of the surfaces is effected by clamping the edge between two pieces of wood jointed together, and rolling out the air-bubbles with a simple apparatus consisting of a piece of thick India-rubber tubing, slipped tightly over an ordinary ruler. When the transfer is to be taken upon wood, stone, or other non-flexible substance, care must be taken that the surface be perfectly smooth, and the air bubbles may be excluded by applying one end of the picture first, and gradually sliding it on. When the mucilage is dry enough, which may be ascertained by raising or bending back one corner of the picture, upon which, if sufficiently dry, the film should begin to separate itself from the glass, the time has arrived for completing its removal, and by means of a feather, the operator introduces between the edge of the picture and the glass, a few drops of water, spirits of wine, or other limpid fluid, which are allowed to percolate between the two, while, at the same time, the one is tenderly and gradually removed from the other. It is possible even to remove the picture in some instances without any fluid whatever; but the inventor considers it the safest practice to use it, unless wax, or oil, or some oleaginous substance, shall have been introduced into the varnish, or into the paint subsequently applied, in which case gentle heat will loosen the picture, sufficiently to enable the operator to remove it. Should there be any traces of fluid perceptible upon the face of the picture, care must be taken to use silk or other material of a soft nature to wipe it off. The transfer is now complete, and if it is desired to colour it, or to get rid of the irridescence that will be perceptible upon it, the inventor takes a pallet of cotton wool, and rubs it over with a little magilp, varnish, oil, or any other softening matter that will not injure its delicate surface, leaving a slight stickiness, to which the dry colours, known as "mansions," and many other dry colours, will adhere; and in some instances, omitting this last operation, water, oil or varnish colours may be employed. The picture is now complete.

The above are the means employed by Mr. Rollason for transferring a collodion or albumen picture. In his specification, he says, "I can by the same means transfer from a plate or glass a plain film of collodion, or albumen, to any suitable base, such as a sheet of paper, or linen, wood or ivory; this will itself form a medium which may be placed in the camera, and a picture taken upon it;" but as this is simply transferring the film *before* the picture is taken, instead of *after*, no further description is necessary.

SMOKELESS FURNACES.

To the Editor of the Mechanics' Magazine.

Sir,—I am constrained to believe that Mr. Baddeley was in error when he penned *his startling and unlooked-for statement*, that Mr. Parker's Smoke Consumer was doing well in these works, and I am free to admit that I was wrong (unconsciously so, considering that I took the opinion of experienced engineers and practical men before I ordered my boiler), in attempting to work with 25 per cent. deficiency of power. It is also most certain, that Mr. Parker committed a great mistake in risking a failure of his patent in the *fiery ordeal of my furnaces*, and as we are therefore all pretty much in the same boat, the best thing to be done is to shake hands and say no more about the matter. I am rejoiced to find that Mr. Baddeley arrives at the same conclusion as myself; "that with properly proportioned boilers, and furnaces skilfully managed, no smoke-consuming apparatus whatever is required." I am of opinion, from the many experiments I have made in this matter, that a smoke-consumer is of no use whatever, even though a boiler should be forced in a very small proportion beyond its power; and I am still further doubtful whether it can be properly looked upon in any way as a rectifier of imperfect stoking, because when Wright's arch was fitted to the steam-engine boiler in question, it scarcely could be said to consume the smoke, when only 45 horse power was on the engine, and at that we could not keep the steam at above 2 or 2½ lbs. pressure; whereas when it was pulled out, the stoker found no difficulty in arranging his fires so as to give the steam required and consume the smoke at the same time. Supposing, then, that these positions of the smoke-consumer are admitted, of what use is it? I think it is most likely it will be found that it is only of use

to rectify the mistake of the boiler-maker, who usually supplies the furnaces, fire-doors, &c., &c.; else why cannot I drive my high-pressure boiler at a maximum pressure of 30 lbs. without the insertion of an arch? There is no mistake that this cannot be done, because when the arch is by accident demolished, which has happened more than once,* the smoke is horrible to look at, and the pressure of steam is proportionably diminished. Now I cannot charge this upon imperfect stoking, because I have been for days and days at it myself, and have at last been reluctantly obliged to come to the conclusion that the fire and its appurtenances are not adapted for the work; whereas in the large low pressure-boiler it is evident that the furnaces are well adapted, without any very great care in stoking, to cause the boiler to do certain work (say 45 horse-power,) and yield 3½ lbs. steam with a perfect combustion of coals. Mr. Baddeley in one of the clauses of his letter, states that my success arises from "patience and perseverance in instructing the workmen," and quotes, or rather misquotes, another sentence in my report. He says, "Failure was alone prevented by care and attention on the part of the workmen." I must refer him to the paragraph in question, in which he will see that the work-people perfected in practice what I started in theory, because in my communication with the police, during my experiments, there was an understanding that I either wholly or partially drew the fires in the Chemical Works after every operation, and that I could not avoid making smoke when these fires were re-lit. This is the point upon which the workmen have perfected my project, for which, by the way, I see Mr. W. Knapton applied for a patent, the description of which is precisely what I have been working for upwards of three years.

Thanks to your Journal for one, this matter is once more fairly before the public. In forwarding you the result of my experiments, which I shall always be happy to do, I only communicate facts as they occur to me; but facts may help science, and science help to place the matter on such a basis and furnish *such data* that succeeding generations may profit by them. I would wind up by an addition to Mr. Baddeley's quotation, "Whate'er is best and *most simply administered* is best;" in other words,—Do not trouble your stoker with too much science.

I remain, Sir, yours, &c.,

ANDREW B. BRANDRAM.

Rotherhithe, Feb. 4, 1856.

* It is made of firebrick.

To the Editor of the Mechanics' Magazine.

SIR,—I have noticed several letters of late referring to the "Smoke Question," and amongst these, the remarks of a gentleman, who is certainly to be commended for his perseverance and patience in surmounting this great difficulty, which he professes to have done, as well as to prove that manufactories can be carried on without resolving themselves into an unhealthy nuisance. This gentleman, Mr. Brandram, has found that slow and careful stoking is quite effectual. I believe there is no more perfect smoke preventer and fuel economiser than an attentive stoker, when he is associated with plenty of boiler surface. The long Cornish boilers have quite settled this question; but where in one instance we find these conditions, in fifty we find them not. Mr. Brandram thinks it impossible to push the effective power of a boiler to its full extent, and at the same time prevent the escape of unconsumed fuel; should this point prove interesting, I will explain a mode which has been found effective for such a purpose.

The plan of using double furnaces, to which that gentleman also alludes, is grounded upon the fallacious notion of "burning the smoke" by contact with an incandescent material; I must acknowledge that it is certainly a fact, as Mr. Brandram states he has found that "no smoke" is a resultant from such a practice; but I must certainly advise all interested to seek some more economical plan, for such can only effect the removal of a visible product by the formation and escape of large quantities of imperfectly-consumed and invisible products. This I am certain may be improved upon; in your next I hope to show how.

I am, Sir, yours, &c.,

THE INVENTOR OF GARDNER'S PATENT SMOKE CONSUMER.

CAMBRIDGE HONOURS.

To the Editor of the Mechanics' Magazine.

SIR,—The following tribute has just been paid to one of your correspondents, and I shall feel obliged by your transferring it to your columns:

"UNIVERSITY HONOURS.—In the list of honours acquired at the University of Cambridge last week, we perceive the name of Mr. Septimus Tebay, of St. John's College, formerly of this town, as twenty-seventh wrangler. On Saturday Mr. Tebay received the degree of B.A. of the University. Mr. Tebay was originally a labourer in a mechanics' shop in Preston, and had received scarcely more than the ordinary education of that class. After he had been thus employed for some years, he was upon one

occasion attracted by a work on one of the lower departments of mathematics, at an old book-stall, and, purchasing it, it formed for some time the amusement and occupation of his evenings. He speedily made himself master of its contents, and he then pursued the study into the higher branches. His fondness for the pursuit became with him a passion, and he soon became known by his contributions to the Ladies' Diary and other mathematical publications, as a master of the exact sciences. Application to his studies brought upon him a serious illness, which incapacitated him for some time from attending to either work or books. On his recovery, he was for a few years employed in a subordinate capacity by the Preston Gas Company, during which time he continued to make further progress in his favourite pursuit. Many gentlemen, to whom his acquirements had become known, considered it desirable to place him in a position where his powers would have a better scope. The late and the present Mr. Lowndes, Mr. C. R. Jacson, Mr. Grenfell, the Rev. J. Clay, and others, interested themselves in Mr. Tebay's favour, and ultimately he was sent to St. John's College, Cambridge, where he has now been studying for the last three years, and where, upon several occasions, he has acquired distinction. In the college examinations of St. John's, in mathematics, he was generally next to the gentleman (Hadley) who is the senior wrangler. Last week, as we have stated, he was placed in the list of wranglers. His position would have been considerably higher, but a few weeks ago intense application induced an attack of his old complaint, and he was compelled to leave the university for some time for change and relaxation, and he was far from recovered when he entered the arena of the Senate House to compete with some of the most distinguished sons of *Alma Mater* for her honours. We congratulate our talented townsman on the position he has earned at Cambridge, notwithstanding the drawbacks he has had to contend against, and hope his future career may be as prosperous as his academic life has been distinguished."

The editor of the *Preston Chronicle*, in which the preceding extract first appeared, is one of Mr. Tebay's personal friends, and since it furnishes a remarkable instance of the successful pursuit of knowledge under difficulties, I have forwarded it to you, in the hope that, besides its value as a biographical sketch, it may possibly serve to encourage some of your readers who may be similarly circumstanced. I heartily join in the desire that he may "go on and prosper." I am, Sir, yours, &c.,

T. T. Wilkinson.

Burnley, Feb. 5, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Tabourin, G. A. *A new system of metallic arch, proper for the construction of bridges, arcades, vaults, roofs, and all other such purposes.* Patent dated July 4, 1855. (No. 1501.)

The fractional arches of this system are generally made of cast-iron united together by jointed under lugs, somewhat like the legs of a pair of compasses, or the parts of a folding foot rule; a central joint bolt is passed through the under lugs. Each beam or girder forming a complete arch is composed of as many fractional arches as may be required to form the total length of the whole beam or arch, the length of each fractional beam or arch having been previously determined. The beams or girders are laid up in parallel lines at a suitable distance from each other, so as to form bridges, vaults, or arcades of the required breadth. They are then united by single bolts passing through the centre of the lugs, which are separated by tubular transoms traversed by the same bolts.

Tidmarsh, R. *An improved apparatus for lubricating metallic and other surfaces when in motion.* Patent dated July 4, 1855. (No. 1502.)

Claims.—1. The application of hollow arms or spoons fitted to a hollow axis which is caused to revolve by a pulley or rigger, these arms or spoons being so arranged that a certain number of them come into operation and supply the lubricating material through perforations in the hollow shaft to which they are attached, when the machinery is moving in its ordinary course, and the others, opening in an opposite direction, supply the lubricating material when the motion of the machinery is reversed, the supply ceasing altogether when the machinery is at rest. 2. The application of a lever attached to a spindle, which is put in motion by a stud or any similar contrivance cast on or screwed into an eccentric or cam, the said spindle carrying a wiper which raises a button in connection with a valve and spindle, a spiral spring being wound round the spindle in order to close the valve after the eccentric or cam has raised and passed the button. 3. The application of a feathered valve in connection with a spindle, one end of the spindle being screwed or provided with a guide plate working on standards, which spindle, guide plate, and valve are raised by means of a button or thumb-screw having an index engraved or stamped thereon, which indicates the rate at which the lubricating material is supplied to the moving surfaces.

Clay, W. *An improved mode of manufac-*

turing forged iron. Patent dated July 4, 1855. (No. 1503.)

The chief object of this invention is to economise metal in the manufacture of shafts, bars, and other articles, by the forging process. This object is carried out in the manufacture of large shafts, by piling together lengths of wrought-iron, of a zig-zag or other such sectional figure as will admit of their interlocking with, and being joined to, each other, and forming together a hollow cylinder. This cylinder is filled with sand, charcoal, dust, or other suitable granulated substance, to form a core, and the ends being closed by welding plugs, the cylinder is brought to a welding heat, and subjected to the action of a hammer, for the purpose of uniting the several pieces together. The inventor claims making shafts, bars, or other articles, by the forging process, by piling together lengths of wrought iron of any suitable section to form a cylinder as above described; also the use of a core previously prepared as described, on which the lengths of bar iron may be piled.

INGLIS, J., and A. COWIE. *Improvements in moulding or shaping metals.* Patent dated July 4, 1855. (No. 1505.)

This invention mainly consists in a mode of moulding cast metal pots, or other articles, wherein the external and internal portions of the mould are rammed upon separate solid patterns, such patterns being formed with conical or level surfaces to produce the parting surfaces of the mould, whilst the boxes are formed with checks or stepped guiding surfaces, or equivalent projections or recesses, to fit to each other and to the patterns, for insuring the accurate and concentric disposition of the parts.

CONNOR, J. *Improvements in apparatus for communicating between the engine-drivers and the guards of railway-trains.* Patent dated July 5, 1855. (No. 1507.)

This invention refers to a mode of arranging a rod or rods attached to each vehicle of a railway train, in such manner that they shall be self-connecting, and so form a continuous rod or shaft, operated by a winch or like means for turning the same wholly or partially round.

ODDY, S. *Improvements in constructing and lubricating the bearings of mule-spindles.* Patent dated July 5, 1855. (No. 1509.)

This invention consists—1. In making the front of the top bolster or rail in which the spindles revolve open, so that a portion of the spindle may be exposed to the action of a piece of felt or other suitable material by which the oil or other lubricating material is absorbed and imparted to the spindles. 2. In making the foot steps of mule-spindles in rails of any convenient length, with a rib to guide the lubricating material into the foot steps. 3. In covering the foot steps with lids extending over several spindles, to prevent the escape of the lubricating material and to keep the flyings out of the foot steps.

HORTON, J. and T. HORTON. *A new or improved manufacture of paper, pasteboard, and pulp.* Patent dated July 5, 1855. (No. 1510.)

This invention consists in the use of spent tan treated by mechanical means for the production of fibre suitable for the manufacture of paper, pasteboard, and pulp.

BULLOUGH, J., R. WILLAN, and J. WALMSLEY. *Improvements in machinery or apparatus for warping by power.* Patent dated July 6, 1855. (No. 1515.)

This invention consists in an apparatus to be acted upon when any of the warp threads break; the said apparatus in such cases comes in contact with oscillating, revolving, or vibratory bars, which, acting upon the driving strap, throw it off from the fast to the loose pulley, thus stopping the mill, and partially preventing the necessity of reversing its motion to tie up the thread or threads when breakage takes place. Also, in the application of a break to the periphery of the fly-wheel to prevent the motion being continued too long a time after the intended stoppage. Part of the aforesaid apparatus is also applied to throw off the driving belt when any required quantity of yarn or thread is measured off.

BELLAY, J. A. *Improvements in manufacturing articles of earthenware and china.* Patent dated July 6, 1855. (No. 1516.)

These improvements consist in certain machinery or apparatus for manufacturing articles of earthenware and china, in which there are two shafts, one placed immediately over the other. The lower shaft carries fast and loose pulleys, and can be caused to rotate by slipping a belt over the fast pulley on pressing down a treadle which at the same time brings down the upper shaft. The lower and revolving shaft has fitted on the top, a mould for shaping the inside of any circular or conical vessel, such as a basin, saucer, plate, &c. The bottom of the upper shaft, which is only free to move up and down in a straight line, has fitted to it a mould, die, or templet for giving the exterior shape to the basin, saucer, or other circular or conical article to be produced. The operation is as follows:—A certain quantity of ceramic material is placed upon the lower mould; the workman depresses the treadle which transfers the driving band on to the fast pulley on the lower shaft, which causes it to rotate, while the same movement of the treadle brings down the upper shaft, and its mould or templet, for shaping the exterior of the article to be

produced: thus the workman has both hands free, and the manufacture may be carried on with great rapidity. A driving band may be passed from a pulley on the lower or revolving shaft to work a turning or throwing board, turning lathe or potter's wheel connected to or placed near the machine, so that while a basin, plate, or other article is being produced at the large apparatus, the clay or rough shape for another article may be thrown or prepared at the turning board.

DURANT, A. H. A. *An improvement in extracting castor oil.* Patent dated July 6, 1855. (No. 1518.)

This invention relates to a method of making and clarifying oil for various purposes for castor seeds, by depriving them of the outer skin or cuticle by means of rollers or stones, or other similar processes, previous to crushing, treating, sieving, and heating them, thus producing a clear and fine oil, which it is proposed to call "castrine," the outer cuticle being then applicable for manure and other purposes. By this process, the thicker portion or sterine which is now lost (by being mixed and left with the outer skin or cuticle) is obtained and the oleaginous or thin portion of the oil is not coloured and deteriorated. The oil thus obtained can be purified by jets of gas, acids, and heat, at about 150° to 160°.

MORRIS, W. R., W. MORRIS, R. CHRIMES, and G. ESKHOLME. *Improvements in the construction and arrangement of apparatus for preventing the waste of water from service-pipes or cisterns.* Patent dated July 6, 1855. (No. 1519.)

This invention relates to certain constructions and arrangements of apparatus for preventing any continuous flow or waste of water from service-pipes or cisterns beyond a regulated and adjusted quantity, and preventing concussion of the valve or cock; and consists in so arranging the apparatus that the valve which, when open, permits of a regulated flow of water passing through it, shall not be under the immediate or direct control of the party opening the same, whereby it cannot be held open at the will of such party, but will always close itself after a certain fixed amount of water has flowed through it.

BECKETT, J., and W. SEED. *Improvements in machinery for spinning cotton and other fibrous substances.* Patent dated July 6, 1855. (No. 1520.)

This invention relates to certain adaptations and modifications of spinning machinery, and more particularly to the machine known as "Smith's Self-acting Mule," whereby a more uniform quantity of twist is produced than by the mules at present in use. The improvements consist of a peculiar arrangement of certain of the working parts of the mule, whereby the spindle and carriage straps are dispensed with, and a peculiar arrangement of ratchet gearing is substituted, by which arrangement a positive motion is obtained. This is effected by the employment of fast and loose driving pulleys on the shaft which works the spindles, such shaft having also keyed on to it a small spur-wheel which gears into a spur-wheel working loose on a carrier shaft. In the side of this wheel are placed one or more catches which bear against a ratchet-wheel on the inner side of a second spur-wheel on the same shaft. When the strap is on, the fast driving pulley motion is communicated to the carriage by means of the ratchet-wheel and catches, and the spindles are at the same time at work. But when the spindles have to stop, the strap is shifted on to the loose pulley, on the boss of which is cast a small toothed wheel communicating by gearing with the carriage shaft. As the ratchet-wheel is carried round independently of the catches, they will have no effect, the spur-wheel to which they are attached standing still.

GEDGE, J. *Improvements in aërated waters.* (A communication.) Patent dated July 7, 1855. (No. 1522.)

Claim.—The application to, or employment in the manufacture of, gaseous or aërated waters of the soluble salts of alumina, or alum, instead of tartaric acid, with alkaline carbonates or bicarbonates, for the purpose of disengaging the carbonic acid gas.

WERNER, C. F., and L. PIGLHEIN. *An improved manufacture of elastic stuffing for chairs, couches, and other articles requiring the same.* Patent dated July 7, 1855. (No. 1527.)

Claim.—The manufacture of an improved elastic stuffing for chairs, couches, &c., from "bast" or the inner bark of the linden tree.

WHITE, A. *Improvements in grinding or reducing grain and other substances.* Patent dated July 7, 1855. (No. 1528.)

This invention relates to a mode of disposing of the millstones and other details of grinding apparatus employed in the reduction of grain and other substances, so that the matters to be reduced may be efficiently rolled or prepared, prior to their entry between the actual grinding surfaces, whilst, at the same time, the grinding action is improved by the distribution of cool aërial currents within and between the stones, and amongst the grain under treatment.

ROBERTS, R., and G. COPPOCK. *Certain improvements in looms for weaving.* Patent dated July 9, 1855. (No. 1530.)

This invention consists in an improved arrangement of parts for letting the yarn off the warp beam, also in an improved combination of parts for picking or throwing the shuttle from one shuttle-box to the other.

Claims.—1. The improved management of parts for letting the yarn off the warp beam. 2. Supporting the side levers of the picking motion in swivel pieces, or in such manner that they are capable of moving laterally and vertically. 3. The improved shape of the picking lever, where it is acted upon by the side lever.

CROSLEY, H. *Improvements in projectiles and the manufacture thereof for ordnance cannon, rifles, muskets, and all descriptions of small-arms, and also in the mode or modes of loading, using, and working the same.* Patent dated July 9, 1855. (No. 1534.)

"For iron spherical bomb-shells or solid or hollow spherical shot," says the inventor, "I cast my projectile having on part of the external surface curvilinear with undulating projections of the same metal, or with square or dovetailed grooves, winding curvilinearly in the direction of the polar or equatorial diameters, at the same time forming a suitable angle with them. Into such grooves, soft metal, such as lead or zinc, is cast, so as to form projections on the surface of the projectile, which projections, being rounded at the edges, wind round the sphere or spheroid, a whole or part of a revolution. At the lower end of the bomb or shot, and next to the charge of gunpowder, is fixed the convex part of a soft metal concave cup, of a diameter equal to, or nearly equal to, that of the bore of the mortar or cannon, and, in the space between the cup and the shell, is wound a rope or spun yarn to the full or a somewhat greater extent than the bore, to serve as a wad; or a short arm of metal may be cast at the lower end of the bomb or shot, to increase the space in which the rope or yarn is to be wound."

NEWTON, A. V. *A new manufacture of fire and burglar proof glass.* (A communication.) Patent dated July 9, 1855. (No. 1535.)

The inventor manufactures plates or pieces of glass with a metallic wire cloth or grating, contained within the body or thickness thereof, and so incorporated therewith that if the glass be shattered or broken into pieces, the mass will continue to be bound together by the wire-cloth or grating, thus presenting the toughness of an iron grating, with the impassable and transparent qualities of glass.

SEITHEN, J. and A. B. *Improvements in machinery for cutting and shaping cork.* Patent dated July 9, 1855. (No. 1536.)

This invention consists in arranging machinery or apparatus, by which pieces of cork may be cut into cylinders or cones, or thin veneers, with great facility. Rotary knives or cutters are mounted on a vertical axis, and receive motion in any convenient manner. They are affixed to arms fixed upon, and at right angles to the vertical axis, and, when cutting cones or cylinders of cork, the knives are fixed by preference to the arms in a vertical position with the cutting edge downwards. The pieces of cork previously cut into suitable lengths and sizes are placed between holders supported on or carried by a circular table fixed in the plane of the revolution of the knives or cutters, so as to present the surface of the cork to the action of the knives or cutters as they rotate.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

HIDE, C. *Improvements in connecting earthenware pipes or tubes.* Application dated July 4, 1855. (No. 1504.)

This invention consists of an improved coupling or junction piece for connecting earthenware pipes or tubes together. The coupling is made in two parts; the lower part has a broad flat bottom to afford a firm basis for the pipes to rest upon. The upper part of the coupling rests upon the lower, and around the inside of the two parts an annular recess is made, communicating with an aperture in the top of the coupling. The ends of two adjoining pipes are laid in the lower part of the coupling, the edges of the pipes being placed over the centre of the annular recess; the upper part of the coupling is put in its place, and some liquid cement poured into the aperture which flows round the recess, uniting the whole firmly together.

FLAGG, S. G. *An improved folding-boat.* (A communication.) Application dated July 5, 1855. (No. 1506.)

This invention consists in an improved method of constructing a boat, viz., by attaching its sides and ends to its bottom by water-tight hinges, in combination with connecting the edges of the sides and ends by water-tight flexible gores, of India-rubber cloth or other suitable material, of such size and shape that the boat may be unfolded, or the sides and ends may be turned down into the same plane with the bottom, as may be desired.

GERHARDI, W. *Improvements in safety-valves and apparatus for regulating the pressure of steam and the quantity of water in steam boilers.* Application dated July 5, 1855. (No. 1508.)

This invention consists in an improved compound safety-valve. Two valves, one opening upwards and the other downwards,

act on the same lever. By this arrangement the centres of the valves can be brought so close to each other that a comparatively small weight, or a light spring only, is required to balance the pressure of the steam. A float is made to let off steam when the level of the water in the boiler is too high or too low, by a double cam fixed on its fulcrum shaft.

HOWARD, J. *Improvements in the construction of ploughs.* Application dated July 5, 1855. (No. 1511.)

This invention relates to the mounting of the wheels of ploughs, the object being to facilitate their vertical and lateral adjustment to suit varying widths and depths of furrows. This is attained by mounting the wheel stalks or standards in horizontal sliding frames, which fit on the plough-beam, and are traversed by means of an adjusting screw, with which they are severally provided. These screws pass through the plough-beam, and on being turned, will move the wheel stalk nearer to or farther from it to suit the width of furrow required to be made. The vertical adjustment of the wheel stalk or standard which slides in socket holes in its frame, is effected by dropping over the stalk a threaded collar or hollow screw, which is keyed at any required elevation to the stalk. Upon this screw works a threaded nut provided with two shoulders which embrace the frame and prevent the threaded collar and stalk from slipping in the frame.

FELTON, T. *Improvements in glass reflectors for gas and other artificial lights.* Application dated July 5, 1855. (No. 1512.)

This invention consists in making glass reflectors in the shape of inverted saucers or plates having holes in their centres so that they may be slipped over the ordinary chimneys. The flat part of such a reflector forms the reflecting surface, and the rim forms an ornamental edge. In order to produce a reflecting surface on the flat part, which shall not entirely obstruct the passage of the light, the upper surface is ground, which has the effect of reflecting the light downwards, and does not entirely obscure it in an upward direction. The reflecting surfaces are also produced by applying oxide of zinc or mercury on the upper surface; but, in order that such coating shall not entirely obscure the light upwards, it is applied in strips or ribs radiating from the centre or otherwise, thus leaving spaces uncovered for the passage of light.

BROOMAN, R. A. *Improvements in the manufacture of figured net and other like open fabrics.* (A communication.) Application dated July 5, 1855. (No. 1513.)

The object of this invention is to produce the ground or net of figured tulle, figured lace, or figured blonde with openings or meshes of different size and shape in the same line of meshes, such as is made upon a bobbin net frame with a Jacquard applied thereto. The frame is what is known as a warp frame, and is provided with needles, on which work the two warp threads, which pass through two heddle hook or guide bars. There is an arrangement of heddle hooks or guides for all the figuring weft threads which are moved by the Jacquard.

ASBURY, J. V. *Improvements in apparatus for neutralizing the effect of collision or impaction in railway trains, stations, and other similar situations.* Application dated July 6, 1855. (No. 1514.)

The inventor prolongs the time of pressure "between contact and perfect infraction taking place" by means of the resistance offered by atmospheric air when confined within a cylinder or cylinders, and acting against a piston; also by a series of elastic air cushions to be used either in combination with the atmospheric air or otherwise.

BALK, W. *Improvements in the construction and combination of parts of portable steam-engines.* Application dated July 6, 1855. (No. 1517.)

In this invention the boiler is made cylindrical, having at one end a cylindrical fire-box formed therein from the hinder part or end, of which several tubular flues proceed to the smoke-box formed at the back end of the boiler, and from the smoke-box at the back end of the boiler other tubular flues proceed to a second smoke-box at the front end of the boiler. Above these return tubular flues is formed a partition or division in the back smoke-box, with an opening and a valve or slide by which, when lighting the fire, the draft may be directed to the chimney or funnel on the upper part of the smoke-box at the back end of the boiler.

BOYES, W. *Improvements in looms for weaving.* Application dated July 6, 1855. (No. 1521.)

As the lathe moves towards the cloth for the purpose of beating up, the ends of the inclined slides strike against fixed buffers or stops attached to the front of the loom, and the slides being thereby pushed back, the inclines recede from the antifriction pulleys on the locking bar, and allow it to rise by the action of the springs underneath, thereby locking the reed effectually at the moment of beating up.

GEDGE, J. *Improvements in photographic glasses.* (A communication.) Application dated July 7, 1855. (No. 1523.)

The "panes" or "plates" to be made are of two kinds—one vitrified and the other

not. The latter are composed of two transparent or translucid glasses. The proof is obtained on one of these glasses by means of a very delicate preparation of albumen and collodion, permitting it to retain great transparency, so as to enable it to properly support the subsequent operations.

NEALE, E. V. *Improvements in the application of vitreous substances to the manufacture of labels, tablets, finger-plates, tiles, and other architectural decorations.* Application dated July 7, 1855. (No. 1524.)

The first part of these improvements consists in the use and employment of glass tubes, bottles, or other bent surfaces of transparent glass, having printed words or inscriptions glued or otherwise affixed to the under surface thereof, in and for the manufacture of labels or tablets. The second part relates to finger-plates for doors, tiles, and other architectural decorations, and consists in the use of moulded or cast glass, decorated on its under surface with patterns or devices in and for the manufacture of such articles.

PYM, J. *A new combination of materials suitable for building purposes.* Application dated July 7, 1855. (No. 1525.)

The patentee adds to five hundred weight of bitumen about five hundred weight of carbonate of lime powder, about one pound of sal-ammoniac, and as much coarse sand or grit as will mix freely with the former materials, when heated in a cauldron. To this is added, as the article may be required to be more or less solid or tenacious, resin, shellac, glue, or pitch, the proportions of which may vary, according to the purposes to which the article is to be applied. To add strength to the combination, when used in the manufacture of railway sleepers or other articles of like character, cocoa-nut fibre, wood shavings, or other fibrous substances, are mixed with it when heated. The material is cast in moulds of the form and size required.

YATES, E. *A new or improved dinner and dessert fork.* Application dated July 7, 1855. (No. 1526.)

This invention consists in making the prongs of dinner and dessert forks much shorter than usual, and giving to that portion of the fork usually occupied by the upper or unused portion of the prongs a continuous and hollow form, that is to say, a figure somewhat resembling a spoon, except that the sides are parallel, so as to preserve the same outline as the ordinary fork.

BURROWS, E. W. *Improvements in machinery adapted for increasing the efficiency of steam-engines and other power.* Application dated July 7, 1855. (No. 1529.)

The principle of this invention depends on "a peculiar application of the gravitating power of a rotatory weight or weights, to the driving wheel of any engine whatever."

FLYNN, H. E. *Improvements in preventing fire from the over-heating of hot-air flues.* Application dated July 9, 1855. (No. 1531.)

This invention consists in "constructing parts, particularly the moveable wheels or slides or valves used to open and close the flues or all or any part or parts of any safety-valves applied to the 'hot-air flues' or 'caliducts' of amalgams," which fusing at lower temperatures than the brass or other metals, or compounds of metals used in the fixed parts of the said hot-air flues, will melt before the heated air reaches a dangerous temperature.

PROPHET, J. *Improvements in the manufacture or production of confectionery.* Application dated July 9, 1855. (No. 1532.)

This invention relates more especially to the manufacture or production of lozenges and similar articles of confectionery. In cutting out lozenges and other articles requiring to be punched from sheets or masses of soft material, the latter in a sheet form is laid upon a traversing board or table and gradually submitted to the action of a set of vertical traversing punches or cutters.

TETLOW, J. *Certain improvements in machinery or apparatus for spinning cotton and other fibrous materials.* Application dated July 9, 1855. (No. 1533.)

These improvements are applicable both to self-acting and hand mules, and consist in an extra delivery of yarn from the drawing rollers, while the carriage is "running up," the twist given to the yarn in the "drum" or "stretch" of the carriage sufficing to give or render the necessary twist to the extra delivery of yarn from the drawing rollers while the carriage is running up.

RILEY, G. *An improvement in the construction of mills for grinding malt and other articles.* Application dated July 10, 1855. (No. 1538.)

The present mode of grinding malt is by crushing it between rollers, by which means the malt is merely flattened into comparatively large pieces, which are in a great measure protected by the husk from the action of the water in brewing; but the inventor finds that in order to obtain the whole of the soluble matter contained in the malt, it is necessary that it should be cut up into very small particles. For this purpose he constructs a mill of cast-iron, the working parts of which are in the shape of frustums of cones, one stationary, the other moving, the inner face of the fixed frustum and the outer face of the moveable one coming in nearly close contact with

each other, and being covered with moveable plates of chill cast-iron or of steel, which contain the cutting surfaces, and which plates, when worn out, are readily replaced with new ones.

FLYNN, H. E. *Improvements in preventing the evil effects of the recoil of cannon.* Application dated July 10, 1855. (No. 1542.)

This invention consists in suspending a cannon or mortar, by means of suspension bars, from an overhead framing. The piece is mounted by its trunnions, in a carriage or frame, which, while the gun is pointed, rests on the ground, but, when the gun is fixed, the recoil is restrained by the suspension bars, and the gun, with the carriage, is raised from the ground, and the force of the recoil is thus absorbed.

ELKINGTON, C. J. C. *Improvements in depositing alloys of metals.* Application dated July 10, 1855. (No. 1543.)

This invention consists in depositing alloys of metals by employing a bath of a solution of the metal in the particular alloy which is most difficult of deposition, and in supplying to this bath the metal or metals which are more easy of deposition only as they are required; and this by preference by placing into the bath a pole consisting of an alloy of the metals which it is wished to deposit. The article to be coated is placed in the bath, and connected with the battery in the ordinary manner; and part of the invention consists in depositing alloys of nickel and silver, with or without the addition of copper, zinc, or tin.

PROVISIONAL PROTECTIONS.

Dated November 14, 1855.

2572. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in the construction of locks. A communication.

Dated January 2, 1856.

8. Andrew Shanks, engineer, of Robert-street, Adelphi, Westminster. Certain improvements in machinery for cutting screws.

Dated January 12, 1856.

89. Alexander Bain, of Westbourne-park-road, Paddington, Middlesex, mechanical engineer. Improvements in the construction of inkstands.

91. Charles François Leopold Oudry, of Rue de l'Echiquier, Paris, France, gentleman. Certain improvements in the preservation of metals and other solid substances.

93. William Owen, of Rotherham, York, ironmaster. Improvements in the manufacture of railway-wheels and tyres.

95. Alexander Bankier Freeland, of Manchester, Lancaster, merchant. Improvements in the preparation of flour for the purposes of its better preservation and carriage, and in the machinery or apparatus employed therein.

Dated January 14, 1856.

97. William Collett Homersham, of Caroline-villas, Kentish-town, Middlesex, engineer. Improvements in machinery for the preparation of hemp, flax, and other fibrous materials.

99. Adolf Pollak, of Vienna, Austria. Treating waste oily matters to obtain a product applicable to the manufacture of soap and other useful purposes in the arts.

101. Nathaniel Shattswell Dodge, of the firm of Dodge, Bacon, and Co., of St. Paul's churchyard, London, merchants and manufacturers. Improvements in the preparation or manufacture of leather cloth.

103. John Gottlieb Ulrich, of Mark-lane, London. Improvements in chronometers and other time-keepers.

105. Abraham Gerard Brade, of Paris, France, civil engineer. Improvements in recovering the wool from fabrics in which the same exists, together with silk or vegetable textile fibres.

Dated January 15, 1856.

107. Pierre Théophile Auguste Nicoulland, of Rue de l'Echiquier, Paris, France, gentleman. Improvements in steam-boiler furnaces. A communication from Le Docteur Bordone, of Vincennes.

109. Samuel Sheppard, of Birmingham, Warwick, manufacturer. A new or improved tap or stop-cock.

Dated January 16, 1856.

113. Henry Law, civil engineer, of Essex-street, Strand, Middlesex. Improvements in heaving up slips for the repair or construction of ships or other vessels, and for a continuous-action purchase for the same, which is also applicable to other purposes.

115. Vincent Scully, esquire, and Bennett Johns Heywood, gentleman, of Dublin. Improvements in the construction of inkstands, applicable in part to other vessels for the reception of fluids.

117. John Hamilton, jun., of Liverpool. Improvements in the posts or uprights employed in constructing electric telegraphs.

119. John Hamilton, jun., of Liverpool. Improvements in constructing the permanent ways of railways.

121. David Dring, of Great Dover-road, Surrey. Improvements in machinery for cutting wood-pegs. A communication.

Dated January 17, 1856.

123. Peter Armand Lecomte de Fontainemoreau, of South-street, London. An improved apparatus for the prevention of accidents or collisions on railways. A communication.

124. Alexandre Tolhausen, of Duke-street, Adelphi, Middlesex, interpreter at the imperial court of Paris. An improved gas-meter. A communication.

125. Philipp Rechten, of Bremen. The taking of whales and other cetaceous fish by means of a harpoon constructed on entire new principles.

127. James Jackson, of Manchester, Lancaster, blind-manufacturer. An improved apparatus for retaining and releasing cords of "Venetian blinds," or cords, bands, or chains employed for other purposes.

128. Oliver Philcox, of Willes road, Kentish-town, Middlesex. Increasing the effect and the facility in fingering the pianoforte, organ, or other musical instrument having a keyboard.

129. William Chapman, of Sunderland. An improvement in propelling vessels.

130. Joseph Jesse Comstock, of New York, United States. Improvements in generating steam. A communication.

Dated January 18, 1856.

134. Joseph Moseley, of Well-walk, Hampstead, Middlesex, esquire. The transport of all goods, merchandise, and valuable commodities whatsoever.

136. Joseph Schloss, of Wellington-chambers, Cannon-street West, Middlesex, merchant. A piston-bolt, or certain improvements in fastening travelling-bags, portmonnaies, cigar-cases, writing-desks, drawers, doors, and similar objects where locks, bolts, or clasps are employed.

138. Henry Griffith Rule, of Manchester, Lancaster, gentleman. Certain improvements in machinery or apparatus for measuring water or other fluids.

140. Edward Myers, of Rotherham, York, engineer. Improvements in buffers and other springs for railway and other carriages.

142. François Jules Manceaux, of Paris, France, gun-manufacturer. Improvements in fire-arms.

144. Charles Weightman Harrison, of Woolwich, Kent, civil engineer. Improvements in transmitting communications, and in the apparatus employed therein.

146. James Buckley, of Oldham, Lancaster, provision dealer. Improvements in looms for weaving.

Dated January 19, 1856.

148. Alfred Dawson, of Barnes-place, Mile-end-road, Middlesex, engineer. An apparatus for converting small coals, or coal-dust, or small coals and coke, or coal-dust and coke, with the admixture of water or other materials, into solid blocks of fuel, parts of which apparatus can be used and are suited for other purposes.

150. John Armour, of Kirkton Bleach' Works, Renfrew, bleacher. Improvements in bleaching, washing, or cleansing textile fabrics and materials.

152. Thomas Horsfall, of Deptford, Kent, engineer, and William Turnbull, of Rotherhithe, Surrey, engineer. Improved machinery for breaking and preparing hemp, flax, and other similar vegetable fibres.

154. Herman John Van den Hout, artist, and Ebenezer Brown, carver, of Kentish-town, Middlesex. Improvements in the preparation of pulp for the manufacture of paper, millboard, and other like purposes.

Dated January 21, 1856.

156. Samuel Fenton, incumbent of St. Mary's, Wavertree, Lancaster. Certain improvements in locks and fastenings.

158. John Gedge, of Wellington-street South, Middlesex. Improvements in the manufacture of boots or shoes. A communication from H. M. Gillon, jun., of Sezanne, France.

Dated January 22, 1856.

162. Pierre Lewis Tieffé-Lacroix, of Metz, France, mechanician watchmaker. Improvements in machinery for cutting files.

164. John Gedge, of Wellington-street South, Middlesex. Improvements in wrought iron wheels. A communication from M. Charpentier, of Paris, France.

166. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Certain improvements in machinery or apparatus for manufacturing nails. A communication.

168. Thomas Hitt, of Tavistock-street, Westminster, gentleman. Certain arrangements of machinery for converting reciprocating into rotary motion.

172. John Beech and Edward Jeffreys, of Shrewsbury, engineers. Improvements in the means of supporting the rails of railways.

Dated January 23, 1856.

174. John Onions, of Wellington-place, Blackfriars-road, Southwark, Surrey, engineer. Improvements in the manufacture of iron.

176. Alexandre Tolhausen, of Duke-street, Adelphi, Middlesex, interpreter at the imperial court of Paris. An improved manufacture of yarn from wool or other felting material. A communication from J. H. Bloodgood, Rahnay, New Jersey, United States.

180. Johannis Joachim Mathias Meyer, of Bartlett's-buildings, London, lithographer. An improved mode of manufacturing bank notes, cheques, and other like documents.

182. Archibald Turner, of Leicester, India-rubber manufacturer. Improvements in the manufacture of elastic fabrics.

184. James Newman, of Birmingham, Warwick, manufacturer, and William Whittle, of Smethwick, Stafford, engineer. Improvements in the manufacture of shafting for mill and engine purposes, which improvements are also applicable to the manufacture of shafts, poles, beams, masts, spars, and other similar articles, in which great strength or lightness, or both these qualities combined, may be requisite.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," February 5th,* 1856.)

2127. David Chalmers. Improvements in machinery or apparatus for cutting the pile of woven fabrics.

2140. Charles Frederick Whitworth. Improvements in signals used on railways, and in parts of apparatus in connection therewith.

2152. Peter Armand Lecomte de Fontainemoreau. Improvements in forging iron. A communication.

2153. Anaxagor Epaminondas Guilbert and Charles Louis Guillemère. A new system of bridle for leading and overruling fiery horses.

2163. Richard Locke Johnson. Improvements in the manufacture of gas for illumination from peat or other substances, and in the apparatus employed in such manufacture.

2179. William Illingworth. Certain improvements in printing earthenware, china, or other ceramic manufactures.

2184. William Kempe. An improvement in machinery for raising the pile on woollen and other cloths or fabrics.

2187. George Baker and Charles Miller. Improvements in the construction of register stoves.

2192. Alexander Sands. Improvements in securing rails in railway chairs.

2194. Laurent-Marie-René Péan. An improved inkstand.

2198. Julian Bernard. Improvements in the manufacture or production of boots and shoes or coverings for the feet, and in the machinery or apparatus, and in the materials employed in such manufacture.

2213. George Frederick Gruet. An improvement in the construction of lamps.

2223. François Modeste Demait. Certain improvements in the preservation of animal and vegetable substances.

2226. Jean Daniel Pfeiffer. Improvements in the construction of knives or cutters.

2232. François Charles Lepage. A new composition or new compositions of materials which may be employed as a substitute for wood, leather, bone, metal, and other hard or plastic substances, and the method of manufacturing the same.

2243. William Rothera. Certain improvements in machinery or apparatus for manufacturing bolts, screw-blanks, rivets, and other similar articles.

2269. William Crees Taylor. Improvements in marine steam-engines.
2306. Enrico Angelo Ludovico Negretti and Joseph Warren Zambra. Improvements applicable to self-registering gauges, thermometers, barometers, and other mercurial meteorological instruments.
2372. William Shears. An improvement in cases or magazines for gunpowder or other explosive preparations or compounds.
2374. Alfred Vincent Newton. Improvements in machinery for making rope and cordage. A communication.
2396. Joseph Charles Frederick Baron de Kleinsorgen. An improved variation and azimuth compass.
2473. Robert Spring Garden. Improvements in the manufacture of hats.
2572. Alfred Vincent Newton. Improvements in the construction of locks. A communication.
2579. John Henry Johnson. Improvements in carding engines for carding cotton and other fibrous materials. A communication.
2717. Frederick Walton. An improvement or improvements in papier maché trays.
2787. Josiah George Jennings. An improvement in the arrangement of the overflow pipes of baths, wash-hand basins, and other vessels.
2788. Josiah George Jennings. Improvements in connecting earthenware rain pipes and soil pipes of water-closets, and in valve water-closets.
2789. Josiah George Jennings. An improvement in the rising pipe and suction valves of pumps.
2905. Isaac Atkins and Marmaduke Miller. Improvements in apparatus for measuring and regulating the flow of gas.
2913. William Symons. Improvements in the suspension roasting-jack.
36. Edward Hammond Bentall. Improved machinery for pulping turnips and other vegetable matters.
56. Alfred Vincent Newton. An improved mode of manufacturing rods, shafts, and tubes of iron and steel. A communication.
85. Alfred Vincent Newton. A new and improved method of curing meats, preserving provisions, and ventilating and cooling buildings, cars, and vessels. A communication.
92. Harry Emanuel. Improvements in the manufacture of spoons, forks, and other similar articles in metal. A communication.
95. Alexander Bankier Freeland. Improvements in the preparation of flour for the purposes of its better preservation and carriage, and in the machinery or apparatus employed therein.
97. William Collett Homersham. Improvements in machinery for the preparation of hemp, flax, and other fibrous materials.
101. Nathaniel Shattswell Dodge. Improvements in the preparation or manufacture of leather cloth.
102. Austen Chambers and William Harrison Champion. An improved mode of working railway-breaks.
105. Abraham Gerard Brade. Improvements in recovering the wool from fabrics in which the same exists, together with silk or vegetable textile fibres.
121. David Dring. Improvements in machinery for cutting wood-pegs. A communication.
125. Philipp Rechten. The taking of whales and other cetaceous fish by means of a harpoon constructed on entire new principles.
136. Joseph Schloss. A piston-bolt, or certain improvements in fastening travelling-bags, portmonnaies, cigar-cases, writing-desks, drawers, doors, and similar objects where locks, bolts, or clasps are employed.
148. Alfred Dawson. An apparatus for converting small coals, or coal-dust, or small coals and coke, or coal-dust and coke, with the admixture of water or other materials, into solid blocks of fuel, parts of which apparatus can be used and are suited for other purposes.
150. John Armour. Improvements in bleaching, washing, or cleansing textile fabrics and materials.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.
230. John Ryall Corry and James Barrett Corry.
241. Jean Baptiste Lavanchy.
251. Louis Guillaume Perreaux.
252. Edwin Pugh.
256. David Chalmers.
258. Frederick Lawrence, William Davidson, and Alfred Lawrence.
273. John Cockerill and Thomas Barnett.
283. Auguste Edouard Loradoux Bellford.
290. Thomas Spiller and Anthony Crowhurst.
292. John Heckethorn.
299. Alfred Taylor and Henry George Frasi.
302. William Brown.
307. John Perkins.
310. Jacob Vale Asbury.

LIST OF SEALED PATENTS.

Sealed February 1, 1856.

1741. Samuel Mellor and Thomas Young.
1748. John Stanley.
1750. Samson Woller and Illingworth Butterfield.
1760. Frederick Robert Augustus Glover.
1790. William Mitchell Tileston.
1795. John Coope Haddan.
1812. George Durham and Cornelius Wyatt.
1818. Philippe Latour and Maurice Latour.
1819. Pontus Lagergren.
1845. John Coope Haddan.
1851. John Avery.
1853. John Barber.
1855. Peter Armand Lecomte de Fontainemoreau.

1881. Alexander Bain.
1886. Pierre Gontier.
1888. Robert Longsdon.
1890. George Lewis.
1902. William Pitt and Edward Turner Davies.
1912. William Kidman.
1926. William Brown.
1943. Charles Esplin.
2010. Agostino Palmiéri and Jean Baptiste Ferrari.
2019. James Fraser.
2027. John McIntyre.
2111. James Willis.
2626. Peter Armand Lecomte de Fontainemoreau.
2632. George Price.
2820. John Henry Johnson.

Sealed February 5, 1856.

1778. Henry Gilbee.
1779. Fischer Alexander Wilson.
1780. John Platt and John Hibbert.
1786. James Alexander Manning.
1797. Philippe Amédée Devy.
1809. Alfred Heaven.
1885. Henry Knighton.
1921. C. Schliekeysen.
1969. John Hope and Thomas Hope.
2227. William Spence.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

Communications have been received from Mr. Baddeley, Messrs. Hostage and Tatlock, Mr. C. J. Recordon, "C.," and Mr. H. League, all of which shall be duly attended to.

CONTENTS OF THIS NUMBER.

Morton and Hunt's Parallel-action Z-Crank Marine Engine (*with engravings*) ... 121
Adams' Improved Spring and Axle box (*with engravings*) ... 124
Joy's Spiral Coil Piston Packing (*with engravings*) ... 126
Marsden's System of Ventilating Mines (*with engravings*) ... 127
Sir Joseph Paxton on the Surplus Patent Fees ... 128
Household Fires ... 130
American Improved Oscillating Engines ... 131
Rollason's Improvements in Photography ... 132
Smokeless Furnaces ... 133
Cambridge Honours ... 134

Specifications of Patents recently Filed:

Tabourin ... Metallic Arch ... 135
Tidmarsh ... Lubricating ... 135
Clay ... Iron ... 135
Inglis and Cowie ... Shaping Metals ... 136
Connor ... Signals ... 136
Oddy ... Lubricating Spindles ... 136
Horton & Horton ... Paper ... 136
Bullough, Willan, and Walmsley ... Warping ... 136
Bellay ... Pottery ... 136
Durant ... Castor Oil ... 137
Morris, Morris, Chrimes & Eskholme ... Preventing Waste of Water ... 137
Beckett and Seed ... Spinning ... 137
Gedge ... Aërated Waters ... 137
Werner & Pigihein Stuffing Chairs ... 137
White ... Grinding ... 137
Roberts & Coppock Weaving ... 137
Crosley ... Ordnance ... 138
Newton ... Fire-proof Glass ... 138
Seithen ... Cutting Cork ... 138

Provisional Specifications not proceeded with:

Hide ... Connecting Pipes ... 138
Flagg ... Folding Boat ... 138
Gerhardi ... Safety Valves ... 138
Howard ... Ploughs ... 139
Felton ... Reflectors ... 139
Brooman ... Fabrics ... 139
Asbury ... Neutralising Effects of Collisions ... 139
Balk ... Steam Engines ... 139
Boys ... Looms ... 139
Gedge ... Photographic Glasses ... 139
Neale ... Labels, &c. ... 140
Pym ... Building Materials ... 140
Yates ... Forks ... 140
Burrows ... Steam Engines ... 140
Flynn ... Preventing Fire ... 140
Prophet ... Confectionery ... 140
Tetlow ... Spinning ... 140
Riley ... Grinding ... 140
Flynn ... Preventing Effects of Recoil ... 141
Elkington ... Alloys ... 141

Provisional Protections ... 141
Notices of Intention to Proceed ... 142
Patents on which the Third Year's Stamp Duty has been Paid ... 143
List of Sealed Patents ... 143

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

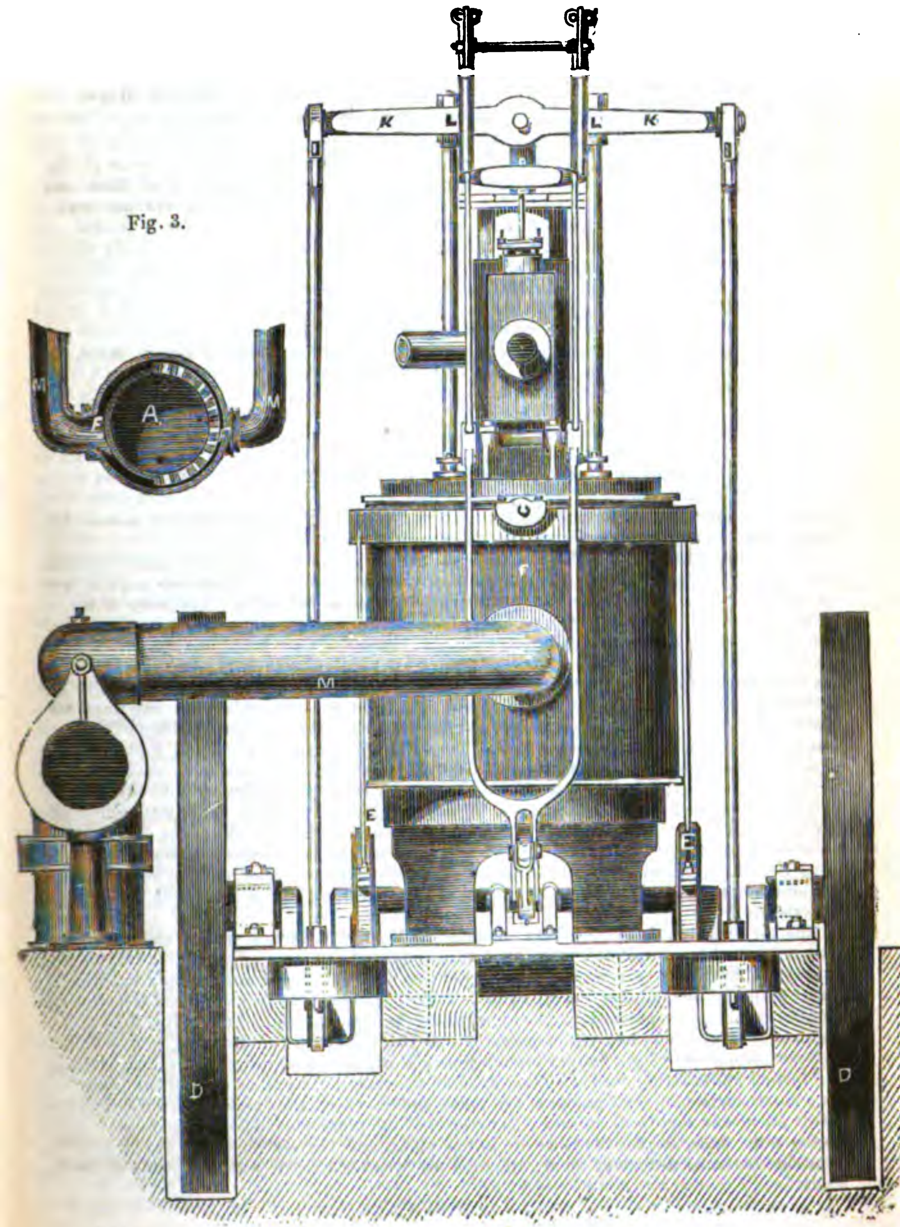
[illegible]cs' Magazine.

No. 1697.] SATURDAY, FEBRUARY 16, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

IMPROVED BLAST ENGINES.

Fig. 1.



IMPROVED BLAST ENGINES.

Mr. E. A. Cowper, of London, recently read at the Institution of Mechanical Engineers, Birmingham, a description of a novel set of six blast engines made for the East Indian Iron Company, to the plans and under the superintendence of Mr. Charles May, the consulting engineer to the Company, by Messrs. James Watt and Co., to the drawings prepared by the author. The engines are six in number, two pairs of them being intended to blow air at 2 lbs. per square inch as a maximum pressure, and the other pair to blow air at 4 lbs. per square inch as a maximum pressure.

Fig. 1 of the accompanying engravings is a side elevation of the engine complete, with crank-shaft, wheels, &c. Fig. 2 is a vertical section through the steam and air cylinders, and their valves and passages, and the branch air pipes. Fig. 3 shows a sectional plan taken through the air valve, and the air passages and branch air pipes.

The general form and construction of the engine is that of a "Pedestal or Table Engine;" the air cylinder, A, stands on a short pedestal, and itself forms the pedestal or table on which the steam cylinder, B, stands. The foundation plate is 6 feet square, and carries a wrought-iron crank shaft, C, in four plummer blocks, having two light fly wheels, D D, one on each end of the shaft, and the two eccentrics, E E, for driving the air valve, F, one on each side of the air cylinder, and the eccentric, G, for driving the steam valve, H, in the centre. The steam piston has one piston rod fixed in a short cross head, I, at the top, and this cross head has two other piston rods for driving the air piston, which pass down outside the steam cylinder through stuffing-boxes in the cover of the air cylinder, and are attached to the air piston. The long cross head, K, taking the connecting rods to the cranks, is attached to the short cross head by a pin, so as to allow a little freedom in case of unequal wear; the guides, L L, are attached to the steam cylinder cover.

The air valve, F, is made under Mr. Archibald Slate's patent, and is a ring or crown valve entirely enclosing the air cylinder, and is not self acting by the pressure of the air in any way, but is moved by the pair of eccentrics, E E, at the proper times, so as to give ample passage for the air to move with the greatest freedom, and the valve has such a proportion of lap as to cause the air to be compressed up to the working pressure before it is delivered, thus giving the engine no more work to do than is necessary.

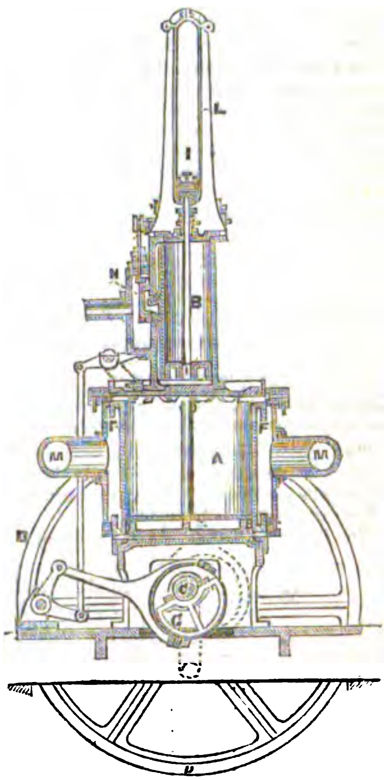
The openings or passages for the air from the air cylinder to the valve are extremely short, and the bars between the openings are made inclined, so as to cause a regular wear on the brass packing rings which form the rubbing face of the valve. The body of the air valve is made of thin sheet iron, neatly curved to two turned cast-iron rings, to which it is well secured by a great number of small bolts; these rings are bored out inside to receive the brass packing rings before mentioned, which are secured in their places by bolts. There are no springs to the brass packing rings, but they are bored out to be a perfect fit to the outside of the air cylinder, and are then cut into eight pieces, and should any wear take place they can be at once adjusted by introducing a thin sheet of paper behind them and screwing them fast in their places again. It should, however, be remarked that this valve is under totally different circumstances from any that have hitherto been made, as it is perfectly in balance, or rather it is suspended perfectly freely, and slides up and down a turned cylindrical surface, and therefore there is no tendency or power to cause wear under any variation in the pressure of the air. The mode in which the two eccentrics drive the air valve is by means of a "gymbal ring;" that is to say, there is a wrought-iron ring encircling the air valve, and attached to it by two pins opposite each other, and the eccentric rods are attached to the ring at two other points at right angles with the first: thus the air valve is perfectly free.

The air cylinder, A, is 30 inches diameter and 2 feet 6 inches stroke, and the piston makes 80 strokes per minute. The air piston is packed with hemp packing, and has a ring to screw it down; the screws are so arranged that they can be got at by simply unscrewing small plugs in the cylinder cover, when a socket spanner can be introduced to screw the ring down. The air passes into the air cylinder beyond the end of the valve, first at one end and then at the other, and is delivered into the hollow part of the valve, from which it escapes through two light copper branch pipes, M M, placed opposite each other, and having turned joints fitting turned collars fixed on the valve. The other ends of the pipes rest on a small surface or shelf prepared for them, and on which they slide backwards and forwards about one-eighth of an inch; these ends of the pipes are curved in the same manner as the other ends, so that the faces are in one plane, and the air main has the faces of its branches surfaced to receive them; thus the air is taken equally from each side of the air valve.

The steam valve, H, has considerable lap, and is so proportioned as to cut off the steam just after the half stroke, and have a very free exhaust.

The boilers are on the Cornish plan, and will be chiefly used with wood as fuel, and the furnaces are made proportionately large for this purpose. The boilers are fed by a donkey engine entirely independent of the blast engines, so that they are complete in themselves, and there is no fear of getting short of water whilst the blast engines stand for "tapping," at which time, indeed, the boiler should always be fed, if only to keep the steam down a little.

Fig. 2.



The engines having to be transported some distance up the country, a limit of weight was given, viz., 1 ton for any one part of the engine; and in accordance with this limitation the total weight of a pair of these engines is only 11 tons as compared with 25 tons, the weight of an ordinary blast engine of equal power; and the weight of the heaviest single piece of an ordinary engine is 4½ tons as compared with 1 ton, the weight of the heaviest piece in the new engines. It is, therefore, evident that the engine can be moved with the greatest facility, and the first pair put to work here for trial simply stood on some balks of timber, and a few small bolts through the bed plates were sufficient to hold them, and cause them to work quite steadily; whereas for the ordinary engine a strong building with massive foundations has to be erected.

The method by which a high speed for blast engines has been attained is simply that of moving the air valves for the air, having, of course, very large valves and passages, instead of letting the air itself move the valves. This arrangement, which was introduced by Mr. Slate to the Institution, at the meeting in July, 1850, at once prevents all blow and jar in the working, provided that the lap and lead of the valve are properly proportioned, and allows of the piston being driven at a high velocity; and, consequently, its diameter may be reduced, and its stroke shortened. This mode of working, combined with the fact of two engines working together as a pair, with their cranks at right angles, causes such uniformity in the flow of the blast, that no regulator of any kind is needed; indeed the variation is hardly perceptible in a mercury gauge placed on a very short length of main, whereas the variation on the ordinary plan is very considerable. The pair of engines are arranged to blow 3,600 cubic feet per minute, and are speeded to 80 revolutions per minute; which, with 2 feet 6 inches stroke, makes 400 feet per minute, and this they do with the greatest ease and efficiency, owing to the exact manner in which the lap and lead and area of passages, &c., are proportioned; but the author does not wish it to be supposed that he recommends a higher speed, or, at all events, a much higher speed; for although we have the example of locomotive engines before us every day, working at higher speeds, we also know something of the cost of repairs of locomotives working at high speeds, and it is evident that what an iron-master wants is a good serviceable engine that will blow steadily on day and night without repairs and stoppages. In addition to these first requisites, there are two other advantages which it is certain are attained by this construction of blast engine, viz., first, great regularity of pressure in the blast, and, secondly, greatly reduced first cost of engine and of foundations.

After the reading of the paper, the Chairman (Mr. W. Fairbairn, F.R.S.) said the engines appeared remarkably compact, and small for blowing a furnace, and the uniformity of pressure obtained by them would be an important advantage. There had been a variety of

plans advocated for obtaining a blast suitable to the different requirements of the cupola and the blast furnace; and he remembered that at a recent meeting of the British Association, the subject had been discussed, and it had been proposed to use the fan for the blast furnace. He understood that there was a furnace, near Chesterfield, blown by a fan; but he did not know the particulars of its application. He also observed that it had been argued in favour of the fan, that the operations of the blast furnace depended on the quantity of air delivered into the furnace, rather than upon the pressure at which it was delivered; and this view of the question was, he believed, more generally entertained now than previously, but he had not heard the results of the practical trial of the fan for blast furnaces. He mentioned that a number of blowing machines, of different constructions, were to be seen at the French Exhibition, showing a great amount of skill and ingenuity; in one of them the general plan of the machine was much the same as that described in the paper, having an upright cylinder like that shown in the drawing, with a very large flat slide valve working on each side, for the admission and discharge of the air.

Mr. Cowper observed that there was a great practical advantage in the engines described in the paper, from the air valve having no side pressure whatever upon it, as it was a circular valve entirely surrounding the blast cylinder, and consequently was perfectly in balance; and being guided very steadily, by fitting the cylinder at top and bottom, its motion was very smooth, and the wear upon it would be very slight.

LONDON FIRES IN 1855.

Twenty-fifth Annual Report. By Mr. William Baddeley, C.E., Inventor of the Portable Canvas Cisterns, Improved Jet-spreaders, Farmer's Fire-engine, &c., &c.

"The statistics of London Fires are by no means devoid of interest, and the time may come when they will form an index to the social advancement of the people; for, in proportion as houses are built more and more fire-proof, and habits of carefulness become more and more diffused, the number of destructive fires will assuredly lessen."—*Knight's London.*

The commencement of the year 1855 will long be remembered for the appalling number of accidents, attended with loss of life, which occurred in various parts of the Metropolis; railway accidents, explosions, falling buildings, and *fatal fires*, succeeded each other with melancholy rapidity.

The following Table shows the Monthly distribution of last year's fires.

Months.	Number of Fires.	Number of Fatal Fires.	Number of Lives Lost.	Chimneys on Fire.	False Alarms.
January	77	1	1	10	3
February	90	3	4	10	8
March	81	5	8	9	5
April	82	3	3	13	12
May	79	0	0	4	6
June	74	1	3	2	8
July	72	0	0	9	9
August	67	3	7	2	5
September	71	0	0	5	7
October	78	2	2	7	12
November	87	3	3	5	9
December	124	5	6	5	7
Total	982	26	37	81	91

The total number of fires in 1855, was 982; being an increase of 28 upon those of 1854, and the largest number yet reported; being an increase of 261 upon the average of the previous 22 years. This increase is due entirely to the last fortnight of the year; the numbers in the middle of December ranging with those of the same time last year. The number of *totally destroyed*, 36, shows an increase of 4 upon those of the previous year; but on the proportional average of the last 22 years, it is a decrease of 5·3.

The number of *seriously damaged* was 334; being an increase of 27 as compared with 1854, and of these 66 were all but destroyed. The number of *slightly damaged*, by a singular coincidence, is the same as last year. Of these fires, 230 were extinguished by the unaided efforts of the inmates of the premises; 362 were extinguished by the inmates with casual aid; while the extinction of 390 devolved upon the firemen.

Parish engine-keepers have rendered efficient aid at 60 fires; but neither their services nor attendances are at all times acknowledged.

The number of *fatal fires* is larger than heretofore, but the number of lives lost is one less than last year.

Instances in which Insurances were known to have been effected:

Upon the building and contents	495
Upon the building only	124
Upon the contents only	117
Uninsured	246
	982
Chimneys on fire	81
False alarms	91
Making the total number of calls..	1154

The *fatal fires* may be distinguished into the following classes, viz.:

	Fatal Fires.	Lives Lost.
Personal accidents from the ignition of wearing apparel	8	8
" " fire-sparks igniting bedding ..	4	6
" " explosion of naphtha	1	2
" " falling walls	1	1
* Inability to escape from burning buildings	9	17
* Killed in attempting to escape	3	3
	26	37

Date.	Place.	Conductor's Name.	Lives Saved.
January 31	No. 37, St. John-street, Clerkenwell ..	Sunshine.	5
February 4	12, Hart-street, Grosvenor-square ..	Brown.	2
" 9	33, Barbican, City	Cook.	2
March 7	2, Clipstone-street, Fitzroy-square..	Moore and Whatley.	2
" 14	8, Salisbury-court, Fleet-street ..	Stevens.	2
" 23	46, Princes-street, Leicester-square..	Welford.	2
" 27	10, Lamb-street, Spitalfields.. ..	Warren.	3
April 20	14, Park-place, Kennington-cross ..	Bagster.	2
May 8	21, Kennington-green	Ditto.	3
June 1	26, Hoxton-market	Barton.	1
" 8	40, Turvill-street, Bethnal-green ..	Ditto.	4
" 11	95, High-street, Shoreditch	Ditto.	3
August 14	16, Hemmings-row, St. Martin's-lane	Gould.	2
" 21	62, Old-street-road	Barton.	1
" 26	7, Triangle, Kennington-cross ..	Ball.	3
October 9	143, High-street, Shoreditch	Barton.	5
" 17	14, Green-street, Blackfriars-road ..	Perkins.	2
" 28	12, York-road, King's-cross	Stanning.	7
November 7	163, Bishopsgate-street	Warren.	6
" 28	130, High-street, Southwark	Barton.	8
December 9	21, Thornhill-place, Caledonian-road	Stanning.	3
" 12	25, Alfred-place, Newington-causeway	Simmens.	2
" 20	25, Mint-street, Southwark	Hall.	6
" 30	31, Brick-lane, Spitalfields	Wood.	1
			77

* Only six of these fires occurred within the district of the Royal Society for the Protection of Life from Fire; two of them being at Bermondsey, one at Greenwich, and one in St. James's, Westminster;

To the *Royal Society for the Protection of Life from Fire*, the past year has been a period of unprecedented usefulness. Their fire-escape stations, *forty-three* in number, are spread over the Metropolis at half mile intervals; and during 1855, no less than 371 fires have been attended by one or more of their conductors. The total number of persons extricated from burning buildings by the escapes and conductors of the *Royal Society* during the last year has been 77, as shown in the table on the preceding page.

The beneficial character and extent of the services rendered, as exhibited in the above summary, may, perhaps, excite some little surprise, from the circumstance of a large number of the foregoing cases being little known beyond the immediate vicinity in which the occurrence took place, no notice appearing in the newspapers of the peril of the rescued, or the praiseworthy exertions of the rescuers. It is a lamentable, but often-observed fact, that if a life is lost—or, as very recently happened, a drunken prostitute set fire to her bedding, and got slightly burned—the *calamity* is *Chronicled* and *Advertised* throughout the length and breadth of the land. "Such mishaps," says Knickerbocker, "like cayenne in cookery, do give a pungency and flavour to the dull detail of history." But when a whole family are snatched as brands from the burning, by the vigilance and heroism of a fire-escape conductor, the thing appears to be regarded as such a perfect matter of course transaction, as to be altogether beneath notice. The *Morning Herald*, however, must be noticed as an honourable exception to this rule, as most of the cases of life-saving have been duly *Heralded* in its pages; and in publishing an annual summary of the happy results of the *Royal Society's* labours, observes:—"We give the summary in full, as presenting in the clearest form the results of an institution of which but little is comparatively known or heard; its officers and stations are only to be seen of a night at our street corners, and the solitary passers by scarcely reflect on the benefits of a machine, required, it is true, but occasionally; but when needed, of more value than the property of a millionaire. It is only surprising that such an institution is a voluntary one. We believe, however, it presents example for imitation to many a public department in DISINTERESTEDNESS, ENERGY, and SUCCESS."

During the eleven years that the Royal Society for the Protection of Life from Fire has been in operation, viz., from 1845 to 1855, the total number of fires attended has been 2,412; and the number of lives saved, 300.

The following fatal fires require a passing notice:—

February 16, 10½ P.M. The most calamitous and largest fire of the year, broke out in the extensive steam saw-mills and timber-yard of Messrs. Routledge, on the north side of Holland-street, Blackfriars-road. The flames burst forth so suddenly, that the fire-illumined sky soon apprised the firemen at the various engine-stations of the outbreak, and procured a rapid attendance at the scene of destruction. A most intense frost prevailed at the time, and the utmost difficulty was experienced in obtaining water. At an early period of the conflagration, a wall and pile of burning timber fell, and buried Mr. Thomas Jackson, (a step-son of Mr. Braidwood) in the ruins. The deceased was a young man of great promise, whose courteous and affable demeanour had endeared him to a large circle of acquaintance, and procured for him the esteem and regret of all who knew him. From Messrs. Routledge's premises, the fire rapidly extended to the flour warehouses of Messrs. Waters, and to the manufactory of Sir John Rennie, on the east; and to the bottle warehouse of Messrs. Hickman, and the oil-cake warehouses of Mr. Scott, on the west. The engines of the Brigade and the West of England having obtained a tardy supply of water, were plied with the utmost vigour, and the steam floating-engine being brought alongside lent its powerful aid; after a few hours' desperate struggle, the spread of the fire was arrested, but it was not wholly extinguished until several days afterward.

On the day following, February 17, a fatal fire occurred at Lock-wharf, Agar-town, from the explosion of a naphtha still; when Mr. C. B. Mansfield,* and Mr. Coppin, his assistant, were so seriously burned, that they shortly afterwards expired in the Middlesex Hospital, to which they were removed.

March 7, 10¾ P.M. A fire broke out in the shop of Mr. Lawford, stationer, in Clipstone-street, Fitzroy-square. The upper part of the house was occupied by numerous lodgers, most of whom were at the time in bed asleep. The moment an alarm was given, Conductor Moore arrived with the Royal Society's escape from Great Portland-street, closely followed by Conductor Whatley, from Trinity Church. Either no effort had been made to rouse the numerous inmates, or if made had failed. Several persons managed to escape

---

three parishes which maintain their own parochial Fire-escapes. At four of the remaining fires, in the Society's district, at which *eight* lives were lost, no less than *twelve were saved!*

* Vide vol. lxii., p. 268; note at foot.

from the first-floor and lower part of the premises, and on the arrival of the escape conductors, two elderly females presented themselves at the second floor window. Moore brought down one, and Whatley the other, and placed them in safety. Hearing that other persons were still in the premises, the Conductors ascended to the third floor windows and tried to make an entrance, as also by the roof; but after getting severely scorched, they were compelled to retreat without being able to accomplish their object. By the exertions of the firemen, the flames were soon extinguished, when in the third floor front room they found the bodies of three females, (an aged mother and two grown-up daughters) and in the adjoining room the body of another female, in all, four lodgers who perished in the fire, the cause of which could not be ascertained.

On the day following, March 8, at noon, a fire broke out in the lower part of the premises of Mr. Rouse, pie-baker, 64, Farringdon-street. So sudden and vehement was the outbreak, that Mrs. Rouse and her father escaped from the lower part of the premises with great difficulty. Two female lodgers were at the time in the second floor in bed. The Brigade engine-station being nearly opposite, all hands were immediately turned out; sub-engineer, Perrier, passing through the next house on to some leads at the back, succeeded in rescuing one of the females, who threw herself into his arms. The other female, Jane Evans, aged twenty-four, got out of the second floor window and hung by the cill for a few minutes; the Brigade jumping-sheet was immediately got out, but before it could be extended the unfortunate woman let go, and fell, receiving such severe injuries as to cause immediate death.

March 14, 2 A.M. A fire was discovered, burning, in the White Swan Tavern, Salisbury-court, Fleet-street. The Police-constables on duty in the neighbourhood had smelt fire for more than an hour previously, but could not detect its whereabout. The fire had commenced in the lower part of the house, at the back, and had ascended the staircase up to the attics before discovered. In the back attic slept a female servant, who perished from suffocation before any effort could be made for her rescue. The Royal Society's fire-escape, from Bridge-street, was promptly brought to the spot, and Conductor Stevens succeeded in rescuing the landlord, Mr. Cook, and his wife, the only other inmates of the premises. The building was nearly burned out, and the roof off, before the fire could be wholly extinguished. The Editor of the *Weekly Dispatch*, speaking approvingly of the promptitude with which the fire-escape was brought to the rescue, and of the praiseworthy exertions of the conductor, Stevens, says, "He seemed a dauntless fellow, well worthy of the post assigned him."

In little more than a week after — March 23, 4¾ A.M., another fatal fire occurred at a coffee, chop, and supper rooms, in Princes-street, Leicester-square, kept by Mr. Sturt. It appeared that the house was only closed at about three o'clock; the inmates consisted of two female servants, who slept on the top floor, a man and woman, lodgers, who were sleeping in the second floor front, while the back room on the same floor was occupied by a female lodger, Mrs. Anthony, who only took up her residence there late the night before. At the time stated, a Police-constable discovered a fire raging in the lower part of the premises, and raised an alarm. The two female servants appear to have been roused by the smoke shortly before, and they succeeded in rushing down stairs and making their escape. In a very few minutes the Royal Society's fire-escape, from Leicester-square, (where it had only been stationed a few days), was placed in front of the burning building by Conductor Welford, and the two persons in the second floor front room were brought down the escape in safety. The conductor was unable to learn if any other person remained in the house, and the staircase being in flames, it was impossible to get to the back rooms to search them. The early arrival and active exertions of the fire-brigade soon extinguished the fire, the ravages of which had been confined principally to the shop, staircase, and two upper rooms. As soon as the fire was put out, Mrs. Anthony was found suffocated, on the floor of her room, which the fire had not entered. Had she put her head out of the window, she might have remained uninjured; at any rate her presence there being seen, would no doubt have led to her immediate rescue.

April 30, 11½ P.M. The City was again the scene of a fatal fire, which broke out in the premises No. 65, Leadenhall-street, in the occupation of Mr. Preston, stationer. The inmates at the time consisted of Mr. and Mrs. Preston, their three children, two female servants, and an apprentice named Parker, between thirteen and fourteen years of age. The third floor was occupied by Mrs. Kent, two children, and a female servant. All the inmates had retired to rest except Mr. Preston; he was about to do so, when he discovered that the lower part of the house was in flames. Having alarmed the whole of the inmates, he assisted them

to escape through a back window on to the roof of some adjoining premises, and it was supposed that all were safely extricated. Unfortunately, however, it subsequently turned out that the apprentice had stopped behind to dress himself, and was overpowered by the smoke and heat which rushed up the stairs into his bed-room. While this was going on at the back of the house no alarm had been given in front; and the constable of the beat, with a fire-escape conductor, were standing within ten doors of the burning building in perfect ignorance of what was going on so close to them. The fire being at length perceived, an alarm was given, the fire-escape was instantly placed in front of the house, and the conductor entered the second floor, which he found fitted up as a printing-office; he therefore ascended to the third floor, but the volume of smoke and heated air pouring out of the window forbad an entrance. At this moment an immense body of rarefied air forced out the first floor windows and shutters, driving them across the street, and the conductor was compelled to descend, with the firm conviction, however, that no life remained in any part of the premises. The firemen were promptly in attendance, but the fire had gained such an ascendancy that there was no chance of saving the front premises. The progress of the flames was, however, arrested in the back premises to which they had extended. The body of the poor boy was subsequently found in the falling debris of the building, but the origin of the fire remained involved in impenetrable mystery.

August 3, 1½ A.M. A fire was discovered by a Police-constable in the lower part of the premises of Mrs. Tribe, beershop keeper, Church-road, St. Pancras. He immediately gave an alarm, and roused Mrs. Tribe and her daughter (the only inmates), who slept in the first-floor back room. In a few minutes they came to the front window, when the constable told them to jump out and he would catch them; but instead of doing so, Mrs. Tribe, with her daughter, went up to the second floor. An explosion shortly afterwards took place, and the house became enveloped in flames, so that, although two fire-escapes were soon in attendance, it was impossible to enter the building, and the inmates had disappeared. The parish engine was brought from St. Pancras Workhouse by a gang of paupers; but, being unaccompanied by any person competent to set it to work, the flames for a time raged uncontrolled, and the house was all but destroyed. The coroner's inquest failed to elicit the cause of the fire, or to explain the extraordinary conduct of Mrs. Tribe. It did appear, however, that she was much depressed in spirits the day before, in consequence of pecuniary embarrassment, and had threatened to destroy herself. The coroner said "it was quite clear the poor woman was in a state of wretchedness on account of the failure of her business; but, after all, there was no proof that she had wilfully destroyed her life;" and the jury returned a verdict of "Accidental Death."

August 11, 11¼ P.M. A most disastrous fire occurred in the premises of Mrs. Fordham, pawnbroker, in George-row, Bermondsey. The inmates at the time consisted of Mrs. Fordham, her brother, Mr. Wood, four sons, and a female servant. Mrs. Fordham being aroused by the smoke, gave the alarm to the other parties, and then effected her escape, with two of her sons, through the next house. Mr. Wood, the servant, and youngest son (only four years old), seem to have made for the street door, and were either suffocated by smoke on the stairs, or perished by its giving way with them. Another son, aged fourteen, appears to have fainted and been suffocated in the top room, where he slept. On the arrival of the Bermondsey parish fire-escape, the smoke was so great that no person could enter the windows. Half-an-hour elapsed before the Southwark mains yielded any water, and the premises were in consequence almost entirely destroyed.

October 17, 3¼ A.M. A fire broke out in the house of Mr. Halliwell, known as the Green Man public-house, in Green-street, Church-street, Blackfriars-road. Mr. Halliwell, Miss Sutton—his wife's sister, and a lodger—John Otten, were the only persons in the premises. The locality is one rarely visited during the night, and the fire was raging furiously in the bar some considerable time before it was discovered by the inmates. Mr. Halliwell, who slept in the second-floor front room, went down to call Miss Sutton on the first-floor, when he found she had jumped from a back window into the yard. He then returned to his own room, for his clothes; but the smoke and heat nearly overpowered him, and he was obliged to get out of window, hanging by the cill, and calling loudly for help. A body of flames from below fired his shirt and burned the lower part of his person, so that he was compelled to drop, falling heavily on to the pavement. The neighbours being now roused, and the police arriving, Mr. Halliwell was conveyed to St. Thomas's Hospital, where he expired the same evening. The lodger leaped out of a window on to the roof of the Christchurch Sunday-school, from whence he was rescued by Conductor Perkins, who arrived with the Royal Society's fire-escape in a very few minutes after the alarm was given. After placing Mr.

Otten in safety, the Conductor next proceeded to rescue Miss Sutton, who lay helplessly in the yard, exposed to the heat of the fire. With the aid of the police, he succeeded in extricating her, and, finding she was much cut and burned, she was also removed to the hospital. The length of time the fire had been burning unperceived, and the large quantity of inflammable spirits on the premises, rendered the conflagration so violent that the fire was not extinguished until the premises and its contents were destroyed. A statement that appeared in some of the newspapers—that "the house was burned down, and a life lost, through opening the doors for the inmates to escape"—was wholly untrue. It was proved on oath by the constable, at the inquest, that no door was *opened*, but that they were *burned away by the fire*. All the inmates had quitted the premises before any assistance reached the spot!

October 27, 11¾ P.M. A fire took place in the shop of Mr. Smith, tailor, No. 3, Dockhead, Bermondsey, through some paper patterns that were hanging against the wall having been ignited. Mr. Smith, his wife, three children and a servant girl, were in the house, all of whom escaped in safety, except the youngest child, a boy one year and ten months old, who was left behind in a crib in Mrs. Smith's bed-room in the confusion, and burned to death.

December 2, 11¼ P.M. A fire, attended with loss of life, broke out in the premises of Mr. Mott, linen-draper, No. 70, Broad-street, Ratcliff. Mr. Mott, on being alarmed by a constable, with his family, happily effected his escape. The shopman, a young man named King, was unable to follow them, and appeared at the third floor window, calling loudly for help; urged by the approach of the flames, he threw himself from the window, and was killed on the spot.

December 20, 5¾ P.M. A most lamentable fire took place in the house of Mr. Bygrave, gas-fitter, &c., No. 25, Mint-street, Southwark. The fire began in a back room on the ground floor, and had made great progress before it was discovered. There were no less than four families in the house at the time of the outbreak. Mr. Bygrave and his family, who occupied the first floor, succeeded in rushing down the burning stairs and escaped into the street, but the egress of all those above was effectually cut off. In the third floor front room slept Mr. and Mrs. Bygrave, sen.; the back room on the same floor being occupied by Lydia Robins, and her child two and a half years old; being very near her confinement, Eliza Powers (another lodger) with two children, was sleeping in her room. Mrs. Powers was awoke, by Lydia saying, "Eliza, get up, the house is on fire;" she said the room was at that time so full of smoke, that a rushlight which was burning, could scarcely be perceived. Mrs. Powers, with her two children escaped, she knew not how, on to the roof of the adjoining house; and Mr. Bygrave, sen., with his wife and another lodger on to the roof of the next house on the other side of No. 25, from whence they were all happily rescued by Conductor Hall, with the Royal Society's fire-escape. The bodies of Lydia Robins and her child, as well as an infant, to which she had given birth in her agony, were afterwards found in the ruins. On examination, it was evident that the fire had been occasioned by a copper-flue in No. 24. The back rooms of the two houses were separated by a brick and timber-framed wall; a copper had been recently set, and was used for the first time only the night before. The "brick noggin" had been used to form one side of the flue, and the end of the furnace abutted immediately against an upright timber, which on the other side of the wall was in contact with the shelves of a cupboard in Mr. Bygrave's back kitchen. Mr. Charlton, the bricklayer who set the copper, said that on sounding the wall, which was coated with plaster, he thought it was a substantial brick wall, and sufficient to form one side of the flue. He admitted he ought to have taken the plaster down, and was sorry he had not done so.

The jury returned a verdict of "Manslaughter against Everett Charlton," and the coroner committed him for trial at the next session of the Central Criminal Court, where he was, however, "acquitted." On reference to the *causes of fire*, it will be seen that no less than thirteen fires were occasioned during the year by the defective construction of copper-flues, but fortunately only one was attended with fatal consequences.

(To be concluded in our next.)

FARADAY'S EXPERIMENTAL RESEARCHES IN ELECTRICITY.

(*Continued from page* 103.)

The next series in this volume (the 22nd of the entire series) gives a long account of various experiments bearing on the connection of magnetism and crystalline forms, or on what Faraday terms the *magne-crystallic* force. It is not easy to give a clear and satisfactory description of this class of facts in anything like a short space; and indeed the whole of this branch of the science remains yet, we believe, in a rather uncertain and unsettled state. The labours of

Plücker, Reich, Weber, Knoblauch, Tyndall, and others, within the last few years, have accumulated a mass of new facts which must be carefully considered before we venture to come to any definite conclusion. These fresh additions to our knowledge are of the greatest interest and importance, for they bring us nearer and nearer to the solution of the great problem of molecular forces. These later researches in some respects modify, and in others extend the previous results obtained by Faraday.

The main feature of this new class of facts discovered by Faraday is, that when a body of crystalline structure is suspended between the poles of a magnet it takes up, or *tends* to take up, a certain position depending on the crystalline arrangement of its particles, and independent of any other properties it may have as a *magnetic* or *diamagnetic* substance. This new force will therefore be found acting sometimes as an auxiliary to the *magnetic*, and sometimes to the *diamagnetic* force; or, in other words, it will sometimes counteract the influence of the one force and sometimes that of the other. Thus pieces of crystalline bismuth were found to point *axially*, *equatorially*, or *obliquely*, according to the different arrangement of their particles. "Other pieces were then taken of different forms, or shaped into various forms by rubbing them down on stone; but they all pointed well, and took up a final position which had no reference to the shape, but was manifestly dependent on the crystalline condition of the substance. In all these cases the bismuth was diamagnetic, and strongly repelled by either magnetic pole, or from the axial line." (page 85.) "The effect occurs with a single magnetic pole; and it is then striking to observe a long piece of a substance, so diamagnetic as bismuth, repelled, and yet at the same moment set round with force axially, or end on, as a piece of magnetic substance would do." "The direction of this force is, in relation to the magnetic field, *axial* and not *equatorial*. * * It is difficult readily to describe the position of this force in relation to the crystal, though most easy to ascertain it experimentally. The form of the bismuth crystal is said to be that of a cube, and of its primitive particle a regular octohedron. To me the crystals do not seem to be cubes, but either rhomboids or rhombic prisms, approaching very nearly to cubes. * *. Whatever be the true form, it is manifest, upon inspection, that the aggregatory force tends to produce crystals having more or less of the rhomboidal shape and rhombic planes; and that these crystals run together in symmetric groups, generally in the direction of their longest diameter. Now the line of *magne-crystallic* force almost always coincides with this direction where the latter is apparent." (pages 88, 89.) This magnecrystallic force "does not manifest itself by attraction or repulsion, or at least does not cause approach or recession, but gives *position* only. The *law* of action appears to be that the line or axis of MAGNE-CRYSTALLIC *force* (being the resultant of the action of all the molecules), *tends to place itself parallel or as a tangent to the magnetic curve or line of magnetic force, passing through the place where the crystal is situated*." (page 90.)

"These results are altogether very different," says Faraday, (p. 87,) "from those produced by diamagnetic action." "They are equally distinct from those discovered and described by Plücker, in his beautiful researches into the relation of the optic axis to magnetic action, for there the force is equatorial, whereas here it is axial. So they appear to present to us a new force, or a new form of force, in the molecules of matter, which, for convenience sake, I will conventionally designate by a new word, as the *magne-crystallic* force." Faraday thinks that "in reference to bismuth and many other bodies, it is probable that magnetic force will give a more important indication in relation to the essential and real crystalline structure of the mass than its form can do. These experiments on bismuth are not difficult of repetition," he adds, "for except those which require the sudden production or cessation of the magnetic force, the whole may be repeated with an ordinary horse-shoe magnet."

On some questions of great interest in the investigation of the nature of this new force, Faraday was not successful in obtaining any positive results; for instance, whether magnetism, when made to operate in a substance in the act of crystallizing, influences the crystalline arrangement of the particles; and secondly, whether crystals *bring away* any temporary or permanent properties or powers from the magnetic field. "I held crystals in different positions in the field of intense action of a powerful electro-magnet, having conical terminations very near to each other; and after some time, removed them and applied them instantly to a very delicate astatic magnetic needle; but I could not perceive that they had the least extra effect upon it, because of such treatment." (p.98). He also endeavoured in vain to obtain any decided answer to the question, "Whether two crystals, or uniformly crystallised masses of bismuth, can mutually affect each other; and if so, what the nature of these affections are? what is the relation of the equatorial and terminal parts? and what the direction of the forces?"

In fact, Faraday seems to have examined the subject in almost every possible aspect; and he has done good service by recording even his merely negative results.

Similar results to those with bismuth were obtained with antimony and arsenic. No proofs of this new force were exhibited, however, by zinc, copper, tin, gold, lead, and several other substances which were tried. Several of the magnetic salts presented very striking magne-crystallic phenomena.

"(2550.) The magne-crystallic force appears to be very clearly distinguished from either the magnetic or diamagnetic forces, in that it causes neither approach nor recession; consisting not in attraction or repulsion, but in its giving a certain determinate position to the mass under its influence, so that a given line in relation to the mass is brought by it into a given relation with the direction of the external magnetic power. (2551.) I thought it right very carefully to examine and prove the conclusion, that there was no connection of the force with either attractive or repulsive influences." To prove this, several very careful experiments were made with a delicate torsion-balance, which were confirmed by others. "(2562.) This force then is distinct in its character and effects from the magnetic and diamagnetic forms of force. On the other hand, it has a most manifest relation to the crystalline structure of the bismuth and other bodies, and therefore to the molecules, and to the power by which these molecules are able to build up the crystalline masses. It appears to me impossible to conceive of the results in any other way than by a mutual reaction of the magnetic force and the force of the particles of crystal on each other; and this leads the mind to another conclusion, namely, that as far as they can act on each other, they partake of a like nature; and brings, I think, fresh help for the solution of that great problem in the philosophy of molecular forces which assumes that they all have one common origin." (Pages 113, 114.)

The application of heat, at a certain temperature (near the point of fusion) was found to destroy the magne-crystallic force in crystals of bismuth; and this may serve to explain the failure of the attempt to influence the form of crystallization by the action of magnetism during the process; "for the metal must acquire the solid state, and be lowered through several degrees, probably, before it can exhibit the magne-crystallic phenomena. If heat has the same effect on all bodies prior to their liquefaction, then, of course, such a process can be applied to none of them."

"(2576.) A most important question next arises in relation to the magne-crystallic force, namely, whether it is an original force inherent in the crystal of bismuth, &c., or whether it is induced under the magnetic and electric influences. When a piece of soft iron is held in the vicinity of a magnet, it acquires new powers and properties. Some persons assume this to depend upon the development by induction of a new force in the iron and its particles, like in nature to that in the inducing magnet; by others it is considered that the force originally existed in the particles of the iron, and that the inductive action consisted only in the arrangement of all the elementary forces in one general direction. Applying this to the crystal of bismuth, we cannot make use of the latter supposition in the same manner; for all the particles are arranged beforehand, and it is that very arrangement of them and their forces which gives the bismuth its power. If the particles of a substance be in the heterogeneous condition possessed by those of the iron in its unmagnetic state, then the magnetic force may develope the magnetic and also the diamagnetic condition, which probably is a condition of induction; but it does not appear at once that it can develope a state of the kind now under consideration.

"(2577.) That the particles hold their own to a great extent in all the results is manifest, by the consideration that they have an inherent power or force—the crystalline force—which is so unchangeable that no treatment to which they can be subjected can alter it; that it is this very force which, placing the particles in a regular position in the mass, enables them to act jointly on the magnet or the electric current, and affect, or be affected by them; and that if the particles are not so arranged, but are in all directions in the mass, then the sum of their forces externally is nothing, and no inductive exertion of the magnet or current can develope the slightest trace of the phenomena.

"(2578.) And that particles even before crystallization can act in some degree at a distance, by virtue of their crystallizing force, is, I think, shown by the following fact:—A jar containing about a quart of solution of sulphate of soda, of such strength as to crystallize when cold by the touch of a crystal of the salt or an extraneous body, was left accidentally for a week or more unattended to and undisturbed. The solution remained fluid; but, on the jar being touched, crystallisation took place throughout the whole mass at once, producing clear, distinct, transparent plates, which were an inch or more in length, up to half an inch in breadth; and very thin, perhaps about the one-fiftieth or one-sixtieth of an inch.

These were all horizontal, and, of course, parallel to each other; and I think, if I remember rightly, had their length in the same direction; and they were alike in character, and apparently in quantity, in every part of the jar. They almost held the fluid in its place when the jar was tilted, and when the liquid was poured off presented a beautiful and uniform assemblage of crystals. The result persuaded me, at the time, that though the influence of a particle in solution and about to crystallize, must be immediately and essentially upon its neighbours, yet that it could exert an influence beyond these, without which influence the whole mass of solution could hardly have been brought into such a uniform crystallizing state. Whether the horizontality of the plates can have any relation to the almost vertical lines of magnetic force, which, from the earth's magnetism, was pervading the solution during the whole time of its rest, is more than I will venture to say." (Pages 118, 119.)

Although it is contrary to our plan in these notices of Faraday's work, to offer any criticism on his purely *theoretical* views until we have brought to a close the detail of his principal *facts*, we cannot allow the passage just quoted to pass without a few observations of our own upon it. The question here raised by Faraday is one which lies at the very root of the whole subject—not only of the whole subject of magnetism, but of what we may call the philosophy of *force* in general. It lies at the foundation of *all* science, indeed, and partakes almost as much of a metaphysical as of a physical character. As a purely *metaphysical* question, of course, it would be of little value or interest to the *physical* inquirer; but it so happens, that every man is, in spite of himself (and often unknown to himself), guided in his physical researches by the metaphysical notions he may have adopted on this point. Faraday himself is a most striking example of this. His metaphysical views are almost as prominent a feature of these "*Experimental* Researches" as his *Experiments* themselves. Whilst his hands are busy with retorts and magnets, tubes and galvanic batteries, his mind is buried in the lowest depths of metaphysical speculation, and wandering in the mazy labyrinths of the Berkeleyan Immaterialism. And what is more—his *experimental* researches are suggested, modified, and guided in a very great degree by these abstract speculations. We believe that many other physical investigators of the present day are influenced by similar views; nor is this to be wondered at.

The point at which modern science has now arrived, is such as, almost necessarily, to give this tone to the mind of the inquirer. The last century or two have been chiefly taken up with the investigation of a class of phenomena, such as the astronomical or purely mechanical (in the ordinary sense of the term), which did not lead to these metaphysical speculations on the ultimate nature of matter and force: but the inquiries of the present day into *molecular* physics, almost *force* the mind into this kind of speculation. Modern chemistry, in its atomic theory and the varied questions of Isomorphism, &c., &c.; modern physics in its various branches of optical, electrical, &c. phenomena, compel the investigator to form some notions as to the ultimate constitution of matter and the true mode of operation of molecular forces. Thus, for example, in the subject of magnetism, we have the inquiry to which our last extract alludes—viz.—What is the true statement of the process by which iron is attracted to a magnet? Are we to accept it as an ultimate fact—beyond which it is useless to inquire further—that iron moves towards a magnet when placed near enough; or can we learn anything as to any *intermediate* steps or actions, which may be said to be the *real proximate cause* of the final motion?

According to the prevailing opinion, we *have* already learned *one* such intermediate step, at least, viz., that which is usually described under the name of *Induction*. But what is this "induction?" If you ask one man, he will tell you that it consists in the separation of two fluids which existed in the iron in a combined state before they were separated by the approach of the magnet. He calls one of these fluids "the positive fluid," and the other "the negative fluid;" and he adds that the positive fluid always attracts the negative fluid, and repels that which is of the same nature as itself. "*Hence*," he concludes, "the attraction of the iron by the magnet. It is not that iron, simply as iron, is attracted by the magnet; it is the *positive fluid* in the iron which is attracted by the *negative fluid* in the magnet, and the negative fluid in the iron attracted by the positive fluid in the magnet, taking into account also the concomitant *repulsions* of course." If you ask another man, he will maintain that there are not *two* fluids, but only *one*. And he will proceed to "explain" the attraction of the iron in *his* way. If you inquire of a third, he will laugh at the idea of these imaginary "fluids," and will assert that it is the "æther," or a subtle medium of some kind, by the motions of which the motion of the iron is produced. Whatever we may think of Faraday's own notions on these subjects, he has, at any rate, done excellent service by pointing out the utter absence of *proof*

of these "positive and negative fluids," and of the similarly hypothetical "currents" in electricity; for it was beginning to be assumed by many writers on these topics, quite as a settled truth, that these positive and negative fluids, currents, &c., &c., not only existed, but afforded perfectly satisfactory *explanations* of all the phenomena. And even where this was not implicitly assumed, yet the constant employment of the words "current," "fluid," &c., necessarily had an injurious effect, by leading the student to accept these phrases as a sufficient explanation of the facts. We are, therefore, heartily glad to meet with frequent warnings against this danger in these "Researches," for Faraday's name and authority are justly of great weight with all writers and students on electricity, and will check the eternal reference to these "fluids" and "currents" which was beginning to be a serious impediment to the true philosophy of the subject.

With regard to "induction," thus much is known to be *fact*. When a magnet is placed sufficiently near to a piece of iron, the part of the iron nearest to the magnet acquires the same properties for the time as those of the end of the magnet farthest from it; and the end of the iron farthest off from the magnet acquires the properties of the end of the magnet nearest to the iron.

Thus, if N and S be the two ends of a magnet, and (*s*) and (*n*) those of a piece of iron, nearest respectively to N and S, as in the figure,

then the end of the iron (*s*) will acquire the properties of the end S of the magnet, and (*n*) will acquire those of N. If N be that which, if the magnet were freely suspended on its centre, would point to the *north* (which is usually termed therefore the North Pole or end of the magnet, and also frequently designated as the *marked* end of the magnet to avoid confusion), it *repels* the north end of a compass needle and *attracts* the south end of that needle. On bringing the iron sufficiently near to the magnet, the end (*n*) will similarly repel the north end of the compass needle and attract the south end; whilst the end (*s*) will repel the south end of the needle and attract the north. Here is the sum and substance of all that we know about "induction." We must apologise to those of our readers who are acquainted with the subject, for introducing such elementary observations, but it will be found convenient, if merely for the sake of reference to the above diagram, in our future discussions. We may remark, in passing, that there is very great confusion in several works on magnetism, in the use of the words "North and South Poles" of a magnet. The confusion arises from this circumstance. Since a *north* pole attracts a *south* pole, and *vice versâ*, if we consider the earth as a magnet, and the north pole of the earth as the *north* pole or end of the terrestrial magnet, the end of the compass-needle which points to the *north*, should perhaps be called the *south* pole or end of the needle; and the French writers on the subject do, indeed, use the terms in this sense. For instance, *Pouillet*, *Elements de Physique*, vol. i. p. 428—9, 4th edition: thus writes, "On appelle *fluide boréal* celui qui domine dans l'hémisphère boréal de la terre, et *fluide austral* celui qui domine dans l'hémisphère austral, et puisque ce sont les fluides de noms contraires qui s'attirent, il en résulte que c'est le pôle *austral* d'une aiguille qui se dirige vers le *nord*, et son pôle *boréal* vers le sud."

Faraday has taken care to state clearly in what sense he employs the words, in a note to paragraph (44) of his Experimental Researches. "To avoid any confusion as to the poles of the magnet, I shall designate the pole pointing to the north as the marked pole; I may occasionally speak of the north and south ends of the needle, but do not mean thereby north and south poles. That is by many considered the true north pole of a needle which points to the south; but in this country it is often called the south pole." We recently noticed a mistaken assertion, doubtless arising from this confusion, in the admirable "Rudimentary Magnetism" of Sir W. Snow Harris; who states (page 92, vol. i.), that the "lower extremity" of an iron bar held vertically, in these latitudes, "becomes a *south* pole, and the upper extremity a *north* pole," &c., although he had in the beginning of his book defined the "*north* pole" as that which "points towards the north," (p. 4.) The fact being, that the lower end of a bar held vertically *repels* the *north* end of the needle, and attracts its south end; whilst the upper end of the bar *attracts* the *north* end of the needle and repels its *south* end; so that the upper end of the bar is (on Sir W. Snow Harris's own definition) a *south* and the lower a *north* pole.

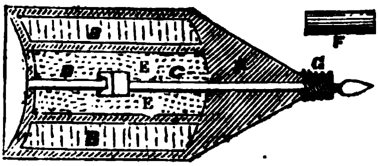
(To be continued.)

PUGH'S FIRE PROJECTILES.

Among several promising inventions which have been submitted to the Government is a fire projectile invented by S. W. Pugh, Esq., of Nelson-square, Peckham, Surrey. Fig. 1 of the accompanying en-

gravings represents a section of this projectile taken through its longitudinal axis. A is a solid iron head with a hardened point. B B is a fire mixture of great explosive power—at least a thousand times that of gunpowder—contained in an outer case. When this case is burst, the greater

Fig. 1. Fig. 2.



part of the mixture, B, which is of the nature of liquid fire, is scattered abroad, emits destructive fumes copiously, and burns upon water or any other substance with which it comes in contact. C is a steel rod, of about 1 inch in diameter. It has a hardened point, which will cut into iron, and carries in its other end a percussion-cap. D is a similar rod with a nipple, on which the cap in C strikes, and which is furnished with two touch-holes. The cap is made to fit the nipple quite tightly. E E is an inner iron case, containing explosive powder, of either slow or rapid ignition. F, fig. 2, is a safety cap for protecting the point of the steel rod, C, thus preventing all danger. This cap is taken off when the projectile is placed in the gun or mortar from which it is discharged. G is a steel screw, which screws into the head, A, and has a fine screw inside to hold the steel rod, C, and a screw outside to hold the safety cap, F. When the projectile strikes an object, the fine thread on the inside of the screw, G, is broken, and the cap in C, is driven down upon the nipple on D, causing instant explosion, by which the liquid fire is scattered, and the iron-head, A, impelled forward.

It is clear, that by the arrangement adopted in the construction of this projectile, the enormous waste resulting from the bursting of the ordinary shells in the air would be avoided.

SURPLUS FROM PATENT-OFFICE FEES.

The Council of the Society of Arts, acquiescing in the opinion that there was room at all events for inquiry into the subject of Sir J. Paxton's letter, inserted in our last No., appointed a very large and powerful committee of inventors and others to consider and report upon it. The first meeting of this committee took place on Friday afternoon. Sir Joseph Paxton, M.P., was called to the chair on the motion of Dr. Booth, F.R.S., chairman of council. It appeared to be the unanimous opinion of the meeting that the first thing to be done was to obtain the recognition by the Government of the principle that the revenue arising from patent fees should be applied solely to furthering the objects of inventors; and that the fees so levied should not go into the general revenue of the country, but should be applied specially for the promotion of the progress of invention. It was shown that this very point was advanced by the committee of the Society which obtained the Patent Law Amendment Act of 1852, and that one of the heads of a bill prepared by that committee was:—"18. That the surplus profits, after paying office expenses and compensations, should be directly applied to some public purpose connected with invention, but not be carried to the consolidated fund." The Amendment Act of 1852 was never looked upon as a final measure. It was remarked by Mr. Webster, that it was all that could be obtained at the time—not all that was wanted; and whilst we were thankful for what was done then, we would now begin again. When once the principle was recognized by the Government, that the surplus arising from Patent-office fees should not form part of the general revenue of the country, then would come the inquiry, as to how best it might be disposed of. It was agreed on all hands to be desirable that all specifications, including those for the last 200 years, should be printed and published at a low rate, and that they should be properly arranged and indexed. It was only by such means that we could arrive at a knowledge of what had been proposed, and hope to avoid some of the loss of labour of re-invention.

In regard to the question of models, it was thought not to be to the advantage of the public to follow the American plan of requiring a model to be deposited of every invention capable of being so illustrated. The American Model Gallery is little better than a lumber-room. Besides, many things of questionable value are patented, and the models in most cases would be rude, and behind the time. Again, many patents are taken out for improvements in details of mechanism; these could not be faithfully exhibited by a model or specimen of the part so improved—the whole machine would be necessary. It seemed to be agreed, however, that models, to a limited extent, might be useful.

Sir Joseph Paxton, M.P., considered that the Patent Law Amendment Act of 1852 was a very great improvement on the previous state of things, and that what was now wanted was not so much a reform of that law as to see that there was a proper admi-

nistration of it. Mr. Charles May, on the other hand, said that everyone engaged, either in taking out patents, in managing patents, or in giving evidence in patent cases in courts of law, must be thoroughly convinced that a radical change was wanted. He hoped that the law would be amended *ab initio*. The present form of obtaining patents by petition to the Commissioners, who neither by time nor education could possibly understand anything of the merits of the application, was absurd, and the fees to the Attorney and Solicitor-generals for doing "worse than nothing," were little less so. Mr. Webster thought that the wholesome working of the present system of repeated payments—that is, £25 for three years, £50 at the end of the third year, and £100 at the end of the seventh year—was shown in the fact that about two-thirds of the patents dropped after the third year. The unwearied and indefatigable exertions of Mr. Bennet Woodcroft, Superintendent of Patents, were highly commended, and the increased facilities and improvements which had taken place within the last few years were mainly attributed to that gentleman, with whom the task was considered to be a "labour of love;" and it was thought that if Mr. Woodcroft were allowed full scope, there would be little to complain of.

The following resolutions, among others, were passed unanimously:

That this Committee concur unanimously in the importance of saving the surplus from absorption in the general public revenue, and that a deputation of patentees and others seek an early interview with the Prime Minister for that purpose.

That it is highly desirable to place the Patent Office upon a footing correspondent with the permanent industrial position of the country, and that steps be taken to press upon the Commissioners of Patents, upon the Government and the Legislature, the propriety of having the surplus arising from patent fees appropriated to that object.

That a Sub-Committee be appointed to consider the present scale of fees and the details requisite to be carried out for placing the Patent Office on a footing of efficiency worthy of the nation.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

VERMEERSCH, F. L. *Improvement of looms for weaving.* Patent dated July 10, 1855. (No. 1537.)

Among other improvements the inventor employs a new regulator for winding the fabric on the cloth beam, consisting of a horizontal and bell-crank lever, pivoted on a small axis attached to the cross framing. To this cross piece is also fixed a graduated iron scale, on which slides a cast-iron piece, furnished with an adjusting lever and spiral spring, its end pressing against the bell-crank lever. On the end of this lever is a detent or pall, which takes into the teeth of a ratchet-wheel, the end of a vertical arm being acted upon by a wooden finger or claw, which carries the shuttle box. The inventor also introduces a peculiar arrangement for stopping the loom, which is an improvement on a former patent of his.

PALMER, J. *Improvements in machinery for carding cotton and other fibrous substances.* Patent dated July 10, 1855. (No. 1539.)

Claim.—The application of a clearing roller or clearing rollers to the licker-in of ordinary carding engines, or to the carrier roller of double carding engines.

KOPP, E. *Improvements in mordants used in printing and dyeing.* Patent dated July 10, 1855. (No. 1540.)

These improvements in mordants used in printing and dyeing consist,—1. In the preparation of mordants with hyposulphites instead of acetates. 2. In the preparation of mordants with solutions made by acids or alkalies of arseniates, phosphates, and chromates, instead of acetates. 3. In the preparation of a mordant, with solutions of bismuth, containing nitric and acetic acids, and in the use of this mordant alone, or combined with iron salts.

BROOMAN, R. A. *An improved means of securing wheels upon axles.* (A communication.) Patent dated July 10, 1855. (No. 1541.)

This invention consists of the following arrangement for securing wheels upon axles. A circular cap is fitted loosely on the arm of an axle adjoining the shoulder, and is secured in its place by a collar, the inner surface of the cap being provided at its edge with a number of curved keys projecting inwards towards the centre. A corresponding number of segmental projections are attached on the back end of the nave or hub. The edges of these projections are "creased" or grooved, and also bevelled longitudinally, and the inner sides of the keys on the cap are bevelled to correspond inversely with the grooves in the outer edges of the projections on the nave, and the edges of the keys are inclined to correspond with the outer edges of the projections. A pin is inserted in the back end of the nave, the inner end of which bears against a spiral spring, a hole being made through the cap to receive the pin. The front end of the nave or hub is covered permanently by a plate, and the band is at-

tached to the back end of its periphery. To attach the nave to the axle, the cap is placed against the back end of the nave, the keys on the cap entering between the projections on the nave. The cap is then turned from left to right, and the keys pass over the outer edges of the projections, while the pin passes into the hole made to receive it in the cap, and prevents the keys from returning off from the projections, when the vehicle is moved backward.

PRATT, H. *Certain improvements in steam flour mills, windmills, and water-mills, parts of which are also applicable to other purposes.* Patent dated July 11, 1855. (No. 1544.)

This invention comprises a method of forming the runner of a metallic back and hub, combined with a disc-grinding face composed of stone, the same being rigidly secured to the shaft by the metallic hub of the runner, when the runner is arranged to operate with the stationary uppermost stone, together with a number of other arrangements which it is scarcely possible to describe without the aid of engravings.

NALDER, J. H. *Improvements in winnowing or dressing grain and seeds.* Patent dated July 11, 1855. (No. 1547.)

This invention relates partly to certain improvements in the machinery or apparatus for which letters patent were granted October 11, 1853, to the present patentee and J. T. Knapp, and relates also to an improved apparatus for hummelling, rubbing, or breaking off the husk or chaff from wheat or other grain, applicable to winnowing machines generally, and to portable and fixed combined thrashing machines, and to thrashing machines generally. The improvements consist, first, in the employment of a double blast, in connection with the cylindrical screen described in the specification of the letters patent before referred to, one blast being directed through the centre or interior of the screen, whilst the other is thrown through the corn as it falls. It is proposed to apply this double blast and cylindrical screen to winnowing machines generally, and to portable and fixed combined thrashing machines, and to thrashing machines of all kinds. The second portion of the invention consists in the employment of a combined cylindrical and conical barley hummeller, equally applicable for hummelling barley, corn, and other descriptions of grain.

WILSON, J. *Improvements in means or apparatus for the manufacture of rolling or piece boards, used in rolling or wrapping piece goods.* Patent dated July 11, 1855. (No. 1548.)

These improvements relate to an arrangement and combination of machinery for trimming the edges of the sides and ends of the boards. The boards, having been cut to the desired lengths and widths, are fed in succession on to a travelling table or carriage, to which an intermittent motion is given, in order that whilst a fresh board is laid on it may be at rest. It then conducts that board past the stationary cutters, placed at angles or otherwise and in succession, and these trim the ends. The boards having successively passed these cutters, are conducted past and in contact with other cutters suitable to give the desired form to their longitudinal edges, by which the boards will be delivered ready for the paper or other covering being applied thereto.

HART, E. *Improvements in the manufacture of lace.* Patent dated July 11, 1855. (No. 1549.)

This invention consists in moving or traversing the pattern threads of one breadth of lace edging, footing, or insertion, whether of cotton cord, silk cord, or any other material capable of being used in the bobbin net lace machine, for the manufacture of ornamental borders and edgings, as the principal means of ornamentation over or under, or partly over or under, according to the arrangement of the lace machine, the breadth of lace edging, footing, or insertion, next adjoining thereto, and either on the back or front surface thereof, in a loose and disconnected manner in form or shape at the will of the designer. These threads or cords are then caught or held by whippers or draw threads, which it is preferred to colour, according to the design to be produced. In the process of finishing, these threads are easily withdrawn, and leave the pattern or parts of the pattern well formed and entirely disconnected from the next breadth, and without injury to the breadth or edging over which such threads have traversed.

COULSON, J. *Improvements in apparatus for ventilating mines, which improvements are also applicable to other purposes where ventilation is required.* Patent dated July 11, 1855. (No. 1550.)

This invention has for its object the supply of atmospheric air to deep workings of mines, especially to adits, levels, and recesses, and passages or workings with closed ends, and to any situations where such supply may be desirable, and not otherwise or so effectually obtainable. A reservoir is fixed on the surface of the ground, at any desired level above the adit working, or place to be ventilated, and so that tubes for conducting air and water may be conveniently connected with a hydro-pneumatic box, which should be placed in such a position that the water may be conveniently carried away.

JEFFREYS, J. *Improvements in sun-blinds or solar-screens.* Patent dated July 11, 1855. (No. 1551.)

These improvements consist in constructing cloth "blinds" in such manner as to screen off the solar rays without interfering with the view from within the apartment. A succession of light wire or wooden frames are hung horizontally one above another, from a few inches to a foot or more apart, each consisting of an inner rod next the window, and an outer one, say six inches to a foot from the former, connected by two or more cross diagonal pieces. From along the inner bar of each frame a breadth of cloth is stretched to the outer bar of the frame next below, and the cloth at each end of the frames is brought round to enclose the sides. Thus, while each frame is horizontal, each breadth of cloth stretching from one side to the other is inclined like a fixed venetian, and the whole are parallel to each other from top to bottom.

TREEBY, T. W. G. *Improvements in revolving fire-arms and cannon.* Patent dated July 11, 1855. (No. 1552.)

This invention consists in substituting an endless chain of chambers for the revolving cylinder of chambers used ordinarily in revolving fire-arms. The endless chain of chambers is formed by hinging the single chambers to each other side by side, and when in use the chambers are brought up in succession to be fired in the same manner as the chambers of ordinary revolving fire-arms.

JEFFREYS, J. *Improvements in steam-boilers.* Patent dated July 11, 1855. (No. 1553.)

This invention consists of improvements upon a furnace patented in 1846. Instead of confining the whole of the fuel between tubes, bars, or pierced walls, the fresh fuel is placed in an ordinary grate much inclined, at the back of which is a narrow trench into which the bright fuel falls, formed of two rows of tubes, vertical or inclined, and kept from overheating by the circulation of the water of two contiguous boilers. The water in one boiler stands at a higher level than in the other, but the steam spaces of the two communicate. The smoke current from the upper fire passes between the upper portion of the back row of tubes, which are longer than the front row, into a deflecting chamber formed in one boiler, and sweeping round and down its concave surface re-enters between the lower portion of this row of tubes into the wall of bright fuel.

ADAMS, J. *Improvements for indicating the time when persons commence and leave their work or calling.* Patent dated July 11, 1855. (No. 1554.)

According to this invention a series of cells or chambers are caused to revolve regularly by clockwork. These revolving cells are enclosed in a box, in the top of which is an aperture from which descends a tube. The cells or chambers are by the motion of the clockwork brought successively under the end of the tube, so that a card or ticket put in at the aperture in the top of the box descends by the tube into one or other of the revolving cells or chambers, and thus registers the time at which it was put into the box.

BIELEFELD, C. F. *Improvements in the manufacture of saddle-trees.* Patent dated July 11, 1855. (No. 1555.)

This invention consists in the application for making saddle-trees of tanogeletin, sulphur, balsam-gumthus, and gutta percha, with a suitable solvent of gutta percha, Venice turpentine being preferred for such purpose.

WILLIAMS, W. *Improvements in the manufacture of bricks, pipes, and tiles.* Patent dated July 11, 1855. (No. 1556.)

According to this invention socket pipes of clay are made by causing a mould of the form of the interior of the socket to be pressed up against the button of the die plate, when the clay commences to be expressed by the motion of the piston, so that the tube, on coming out through the die plate, comes against this mould and is expanded to the form of the interior of the socket. The exterior form of the socket is given by a projection of a suitable form from the face of the die plate; and motion is given to the pistons of brick, pipe, and tile machines by means of a cam or eccentric on the main axis, which acts on rollers or trucks on the backs of the pistons.

GREENING, B. *Improvements in machinery for washing and mangling, parts of which are applicable to churning.* Patent dated July 12, 1855. (No. 1557.)

This invention consists—1. In an improved combination of machinery for giving a partial rotary, in addition to an up-and-down motion to the instrument, by which the fabrics to be washed are agitated in the washing-tub. 2. In improvements in machinery for mangling, consisting of an improved arrangement of parts for reversing the direction of rotation of the mangling rollers and board on which the fabrics are placed. 3. In the application of the improved machinery first mentioned to churning.

ROBINSON, J., and W. WEDDING. *Improvements in machinery for cutting paper, cardboard, and other materials.* Patent dated July 12, 1855. (No. 1558.)

This invention consists — 1. In giving motion to the cutting knife of machines

used for cutting paper and other materials, by means of a crank, which takes into a slot in an open link or radial arm connected to the cutting knife. 2. In directing the motion of the cutting knife by means of a curved or inclined slot and a stud. 3. In adjusting the cutting edges of the knife by eccentrics or cams acting on the back of the blade.

BETHELL, J. *Improvements in preserving meat, fish, fruits, and other eatables from decay, and for the purpose of their being used as provisions.* Patent dated July 12, 1855. (No. 1559.)

This invention consists in a method or methods of very slowly drying animal and vegetable substances within kilns, houses, or chambers, in an atmosphere rendered as anhydrous or dry as possible, and the temperature of which is regulated at from 90° to 130° of Fahr., but which latter temperature is on no account to be exceeded (albumen not being coagulated at that heat), whereby the juices of the articles so dried remain in a soluble state. The atmosphere so employed is rendered anhydrous or as dry as possible, in order to absorb readily the water which is driven off from the substances to be dried.

EDWARDS, F. H. *Improvements in obtaining motive power from fuel, air, and water.* Patent dated July 12, 1855. (No. 1560.)

This invention relates to improvements in obtaining motive power by burning fuel in compressed air, and forcing the products of combustion through water, and applying the steam thus formed, together with the products of combustion, to the actuating of a steam or similar engine.

CHATTAWAY, E. D. *Improvements in buffing and coupling apparatus for railway carriages and rolling stock.* Patent dated July 12, 1855. (No. 1561.)

This invention relates to the combination of the whole of the buffing, coupling, and drawing apparatus of railway carriages and rolling stock, upon a single central rod in each case, thus dispensing with the use of separate corner buffers and side chains, as hitherto employed. It is an essential feature of this contrivance that the buffer and draw-hook are in each case combined in one piece or arrangement. Instead of being a plain circular disc, the buffer-head is of a peculiar irregular form, the lower portion or side being curvilinear, approximating to a semicircle, whilst the upper portion is a narrow rectangular piece, so that the end of the wide coupling link which embraces this projection, can work upon it as upon a draw hook. The draw rod is screwed near its end, just within the buffer head; upon this screwed part is fitted an adjusting nut and collar furnished with projecting arms, carrying links connected with the large coupling link. By this means the coupling can be drawn hard up, or slackened off, as may be required. The inner face of the upper projection of the buffer head is shaped like a large hook, so that the wide link of the neighbouring carriage, when dropped upon it from the upper side, produces the hook and link connection.

CALDOW, J. and J. B. A. M'KINNELL. *Improvements in machinery or apparatus for cutting or reducing vegetable substances.* Patent dated July 12, 1855. (No. 1562.)

This invention relates to a "Turnip-cutting Cart," or apparatus for cutting, slicing, or pulping turnips and other vegetables, during the actual traverse of the cart over the ground. In its general external form and arrangement, the cart or locomotive cutter resembles an ordinary box farm cart, with a chest or box below the axle, placed on a single pair of running wheels, and drawn by one horse. The body or chest portion of the cart or machine is divided into two sections. The upper one, which corresponds to the ordinary cart box, and contains the uncut vegetables, is formed with a grated or ribbed bottom, whilst the lower one, formed by adding a secondary box, acts as the receptacle for the vegetables when cut. The cutting cylinder or cylinders may either be fixed upon the cart axle, or be actuated through the agency of gearing or other suitable connection with the axle nave, or some other part or parts of one or of both of the running wheels.

SIMONS, E. *A new or improved instrument or apparatus to be used for condensing and absorbing the smoke and products of combustion arising from gas and other flames, and increasing the illuminating power of the said flames.* Patent dated July 12, 1855. (No. 1563.)

This instrument or apparatus consists of a bell-glass or other shaped vessel having at its lower end or open mouth an annular vessel containing any solid or liquid absorbent of carbonic acid gas, and provided where it is deemed necessary with a concave or convex reflector.

OBISSIER, R. D. *Improvements in obtaining motive power by hydraulic means.* Patent dated July 12, 1855. (No. 1565.)

Claim.—Raising water by pumps or other analogous means driven by the water engine, with the addition of a supply raised by a separate steam engine or other power, or maintained at the level of an upper cistern, for the purpose of driving wheels from which motive power is obtained.

TUCK, J. H. *Improvements in apparatus for condensing or exhausting atmospheric air or other elastic fluids.* Patent dated July 13, 1855. (No. 1566.)

Claims.—1. The use of a piston or plunger submerged in water or other fluid, the motion of which piston is transferred through the fluid to its surface, which is thereby made to act as a piston for the purpose of condensing or exhausting atmospheric air or other elastic fluid. 2. The use of small auxiliary pumps for the purpose of changing the liquid used in the body of the apparatus, in order to prevent any inconvenient degree of heating or refrigerating of the apparatus, the change of liquid being effected on the backward stroke of the larger piston of the apparatus. 3. A general arrangement and combination of parts designed to produce the above results.

REDMAYNE, T. *Improvements in stove grates.* Patent dated July 13, 1855. (No. 1568.)

In carrying out this invention, to the bottom part or grate bars is cast a hollow gutter, with one or more holes to allow the ashes to fall through. An ornamental portable front is cast in one or more parts, which conceals the ash-pan or pit. A fender or guard is also cast, either plain or ornamental, which may be either cast with the portable front, or separate, as may be required.

Claim.—The construction and arrangement of stove grates, with hollow gutters, portable fronts and fender, either cast together or separately, to dispense with the use of ash-pans.

LISTER, S. C. *Improvements in weaving looped or piled fabrics.* Patent dated July 13, 1855. (No. 1570.)

This invention applies to looms which are employed to weave pile fabrics when very fine pile wires are used, and are attached to lever arms, or other instruments, which introduce the wire into the open shed, hold it while it is tied into the fabric, and then withdraw it from the fabric, so as to leave a series of loops on the surface of such fabric, or, by the cutting of these loops, producing velvet pile, the lever arm or other instrument which is operated upon to introduce and withdraw the wire, never being at any time released from the wire which it actuates, and, consequently, necessitating the employment of a separate instrument and actuating apparatus to each pile wire. And it consists in so applying and actuating a supporting trough with each wire, that such trough may be caused to travel into the open shed with the wire and then be withdrawn, leaving the wire to be beaten up and tied into the fabric.

BOUSFIELD, G. T. *Improvements in the manufacture of boots and shoes.* (A communication.) Patent dated July 13, 1855. (No. 1571.)

Claim.—The manner of making lasts by making a mould from the foot, and casting the last therein.

COCHRAN, R. *An improvement in the manufacture of clay for potters' use.* Patent dated July 13, 1855. (No. 1572.)

In preparing clay for potters it is made into what is technically called "slip," and, in place of treating the clay or slip as heretofore, this improvement consists in placing the same in a vessel, and boiling it by means of steam introduced into a small space between an inner and outer vessel.

HORNSBY, R. *Improvements in thrashing-machines.* Patent dated July 13, 1855. (No. 1573.)

This invention has for its object improvements in the shakers or riddles of thrashing-machines. In constructing shakers, composed of inclined parallel laths or bars, it has been usual, in some cases, to have the upper edges of the parallel laths or bars of each frame in the same plane or line; but in other cases transverse bars or boards have been added above the general surface of the shaker. The present improvements consist in applying a series of pegs or projections, with intervals between them, and such pegs or projections may be of like or of different heights, and rods or wires are also applied transversely across the frames, parallel with the upper edges of the inclined laths or bars.

YATES, R. *Improvements applicable to the instruments termed "lock" knives, and "lever" knives, part of said improvements being applicable also to such surgical and other instruments as may be connected to handles by moving joints.* Patent dated July 13, 1855. (No. 1577.)

These improvements consist in the production of a compound instrument which is both a "lock" and a "lever" knife, which, like the present lock knife, is made with several distinct pairs of "scales," so as to form several distinct parts which may be separated from each other, and yet may, by means of the locking mechanism belonging to such parts, be all secured together; the instrument is provided with a knife, fork, and spoon, opening and shutting upon joints.

KOCH, L. *An improvement in machines for making pulp from wood and vegetable fibrous substances.* Patent dated July 13, 1855. (No. 1578.)

This invention mainly consists in the employment of a series of rollers, increasing gradually in diameter and speed in proportion as the substance which is introduced between the rollers with the fibres or grain parallel to the length of the rollers, is extended or pressed out. An increase of speed is given to one of every pair of rollers by which means a slight dividing or sepa-

rating motion is exerted on the substance under treatment.

POLIESSE, L. C. J., jun., and C. A. J. LENGELÉE. *Improvements in the manufacture of encaustic matters.* Patent dated July 13, 1855. (No. 1583.)

These improvements consist in substituting stearine for wax, in the encaustic matters used for coating floors, &c., by combining it with essence of turpentine, and colouring it with a tone similar to that of the surface to be coated.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

JOHNSON, J. H. *Improvements in apparatus or means for facilitating the performance of church and other music on organs, harmoniums, pianos, and other similar keyed musical instruments.* (A communication.) Application dated July 11, 1855. (No. 1545.)

This invention relates to a peculiar construction and arrangement of apparatus, to be fitted over the keys of an organ, harmonium, piano, or other similar keyed instrument, whereby any performer who is capable only of reading or playing one note at a time may, by depressing such notes singly, produce any of the chords or harmonics required in the performance of musical pieces.

JOHNSON, J. H. *Improvements in the permanent way of railways, and in carriages to be used in connection therewith, or on common roads.* (A communication.) Application dated July 11, 1855. (No. 1546.)

This invention relates to an improved construction and arrangement of the permanent way of railways, and of railway wheels to be used thereon, whereby the trucks or carriages are rendered equally applicable for transport, either on common roads or on railways. The permanent way consists of an improved construction or form of rails and sleepers, and of a mode of securing the rails to the sleepers, whereby the junction is effected without either chairs, screw-bolts, pins, or wedges. The rails are rolled with a rounded surface on their working sides, whilst their lower faces or bearing surfaces are perfectly flat, with a projecting dovetailed rib running along their entire length. This dovetailed rib is slid into and accurately fits a corresponding groove in the longitudinal sleepers, the rails being thus securely held therein without any other fastening whatever. The longitudinal sleepers are fitted into recesses formed in transverse sleepers, which serve as the main foundation or support of the way, and are secured by wedges or key-pieces. The improved wheels consist of a species of broad double tyre, one portion of which is of slightly larger diameter than the other, the larger flange being made sufficiently broad for running on common roads, whilst the small portion is adapted to run on the rails of the permanent way.

WESTON, J. H., and J. E. LEWIS. *Improvements in the construction of moderator lamps.* Application dated July 12, 1855. (No. 1564.)

Instead of constructing the lamp with an enlarged diameter at the base to form an oil chamber, the inventor proposes to make the lamp stem the oil chamber, and by that means so to reduce the diameter of that part as to admit of the lamp fitting into a Palmer's candle-stand. The loose piston slides over a central supply pipe, which forms a guide for its ascent and descent, and the piston is attached by a chain or wire cord to a barrel, which, when rotated by a key, will wind up the piston, and allow the oil supplied to the lamp to pass below the piston. The oil supplied to the lamp enters the central supply tube at its lower end, having first to pass through a wire gauze or other suitable strainer at the bottom of the chamber.

HIGGIN, J. *Improvements in clearing and brightening dyed and printed fabrics.* Application dated July 13, 1855. (No. 1569.)

It is usual to pass goods dyed with preparations of madder, either alone or mixed with other dye stuffs, through a solution of chloride of lime in water; then dry them, or expose them to steam, rinse them in water, and again dry them. It is now proposed to add to the chloride of lime solution a liquid containing silicic acid in solution, and to use this mixture instead of the chloride of lime as above.

GILLETT, E. *Improvements in fixing artificial teeth.* Application dated July 13, 1855. (No. 1574.)

According to this invention, the front single teeth are fixed by the soldering of a pin on to the base plate. This pin slides into a dove-tailed groove in the back of the tooth, and is fixed by a fine screw.

LAWTON, M., and T. SCHOFIELD. *Improvements in machinery or apparatus for preparing, spinning, winding, and doubling cotton or other fibrous substances.* Application dated July 13, 1855. (No. 1575.)

This invention relates to machinery in which spindles and flyers are used, and its object is to give them greater velocity and steadiness than they usually have. The flyer is mounted in a separate bearing formed upon a horizontal rail extending from one end of the machine to the other; the spindle is mounted in bearings formed on the copping rail, having sufficient length above to drive and steady the bobbin. As the flyer and spindle re-

volve independently, the traverse of the copping rail equals the length of the bobbin required.

BROOMAN, R. A. *An improvement in pumps.* (A communication.) Application dated July 13, 1855. (No. 1576.)

This invention consists in making the barrel, piston, valves, and passages of pumps of gutta percha, solidified caoutchouc, or other similar material.

BURNS, R. *Improved teeth gear.* Application dated July 13, 1855. (No. 1579.)

This invention consists in facing or forming (or covering what would otherwise be) the rubbing surface of the teeth of toothed wheels with wood, metal, or other like substances.

GRAFTON, H. *Improvements in the manufacture of fire-lighters, which are also applicable for other burning purposes.* Application dated July 13, 1855. (No. 1580.)

These improvements refer to ventilating fire-faggots, and consist in forming them of timber cut into pieces of a suitable size, and by preference across the grain; and in order to render them ventilating, holes are bored, punched, or otherwise formed through them, and afford passage for the flame and air, and facilitate their burning. These lighters or faggots are dipped in resin or other inflammable material and otherwise prepared for igniting as usual.

PROVISIONAL PROTECTIONS.

Dated November 15, 1855.

2577. George Lister, of Leamington, Warwick. A cooling apparatus to be used in brewing.

Dated December 7, 1855.

2765. William Irlam Ellis, of Salford, Lancaster, engineer. Certain improvements in the slide valve or valves of steam or other motive power engines.

Dated December 12, 1855.

2805. Robert W. Davis and Daniel Davis, of Yellow Springs, Ohio. An improved vice.

Dated December 15, 1855.

2836. George Coats, of Glasgow, Lanark, coalmaster. Improvements in horse-shoes and in attaching the same to horses' feet.

Dated December 28, 1855.

2935. Francis Preston, of Manchester, machinist. Improvements in the construction of military small-arms.

Dated January 3, 1856.

19. James Bagster Lyall, of Castle Frome, Hereford, gentleman. Certain improvements in carriages.

Dated January 9, 1856.

67. Frederick Albert Gatty, of Accrington, Lancaster, manufacturing chemist. Improvements in the manufacture of lake colours.

71. John Ashworth, jun., of Turton, Lancaster, cotton-spinner. Certain improvements in lap machines or apparatus used in the preparation of cotton and other fibrous substances for spinning.

Dated January 10, 1856.

79. John Erskine, of Glasgow, Lanark, merchant. The application of a new material or mixture for dressing or sizing textile fabrics or materials.

Dated January 18, 1856.

133. Giuseppe Antonio Tremeschini, of Vicence, (Lombardo Venetian), mechanician. Improvements in electro-telegraphic communications.

135. Miguel De Bergue, of Barcelona, Spain, engineer. Improvements in the permanent way of railways.

137. William Marshall, of Smethwick, Stafford, manager of iron works. An improvement or improvements in rolling iron for the manufacture of gun-barrels and tubes, and for other like purposes.

139. David Shaw, of Gee-cross, Chester, manufacturer. Certain improvements in looms for weaving.

141. Nathaniel Shattswell Dodge, of St. Paul's-churchyard, London, of the firm of Dodge, Bacon, and Co., merchants and manufacturers. Improvements in treating vulcanized India-rubber or gutta percha. A communication.

143. Jonathan Holden, of Halifax, York, printer. Improvements in machinery for cutting or carving and figuring wood.

145. Joseph Marzolo, of Padua, and at Paris, France, Rue des Petites Ecuries, organ-builder. "A reproductive organ," printing with known notes any musical fancies, and equally applicable to pianofortes, melodiums, harmoniums, accordeons, and generally to all keyed musical instruments.

Dated January 19, 1856.

147. Alfred Heaven and William Booth, of Manchester, embroiderers by machinery. Improvements in machinery for embroidering fabrics.

149. Edward Pickering, of Chatham-place, Blackfriars, Middlesex, railway contractor. Improvements in the permanent way of railways.

151. Isaac Barnes, of Birmingham, Warwick, manufacturer. Improvements in carriage lamps.

153. Frederick Ayckbourne, of Princes-street, Stamford-street, Surrey, gentleman. Improvements in the cleaning of knives and forks.

155. Charles Robertson, of Mark-lane, ship master. Improvements in mariners' compasses.

Dated January 21, 1856.

159. James Pockson, of Penton-street, Walworth, Surrey, carpenter. Improvements in the construction of roofing and other tiles.

Dated January 22, 1856.

163. Jean Baptiste Pierre Alfred Thierry, jun., Jean Lewis Richard, of Paris, chemist, and Baron Henry de Martiny, of Versailles, France. Improvements in preventing smoke by means of a fumivore hygienic apparatus.

165. John Gedge, of Wellington-street South, Middlesex. Improvements in bending, edging, and soldering tin. A communication from M. Blanchefort, of Briey, France.

167. Alexander Robertson, of Upper Holloway, Middlesex, engineer. A new manufacture of cases or canisters for dry goods, edibles, and such like commodities.

169. Edward Lawson, of Leeds, York, machine-maker, and George Jennings, of Hunslet, Leeds, mechanic. Improvements in reeling machines, for winding flax, cotton, wool, and other yarns.

171. Joseph Francis, of New York, United States, engineer. Improvements in the manufacture of metallic boats.

173. Henry Elliott Hoole, of Green-lane Works, Sheffield, York, stove grate and fender manufacturer. Improvements in stove grates.

Dated January 23, 1856.

175. George Holcroft, of Manchester, consulting engineer, and James Peacock, of Salford, Lancaster, mechanical engineer. Improvements in casings for fencing horizontal shafts.

177. Alexandre Tolhausen, of Duke-street, Adelphi, Middlesex, interpreter at the Imperial Court of Paris. An improved lock joint for the rails of railways. A communication from James Richard Hilliard, United States.

179. Edward Lloyd, of Dee Valley, near Corwen, Merionethshire, North Wales, engineer. Improvements in valves, and in the valve-gear of locomotive and other steam engines.

183. Isaac Barnes, of Birmingham, Warwick, manufacturer. Improvements in the manufacture of knobs and furniture for doors, drawers, and other similar purposes, parts of which improvements are also applicable to the manufacture of cornice poles and other like articles.

185. Stephen Norris, of New Peter-street, Westminster, Middlesex. Improvements in the manufacture of boots and shoes and other coverings for the human feet.

Dated January 24, 1856.

186. Louis Antoine Romain Richoux, of Paris, watch and clock maker. Improvements in clock works.

187. Pierre Samain, of Meusnes, France, lock maker. An improved levelling instrument.

188. John Solmons, of Birmingham, Warwick, merchant, and Edwin Lander, of Birmingham, merchant. A new or improved cigar holder.

189. Charles Rothwell, of the firm Taylor, Lang, and Co., Castle Iron Works, Stalybridge, Chester. Improvements in self-acting mules.

190. John Strafford, lamp maker, of Stratford, Essex. Certain improvements in portable signal lamps, for railway, marine, and other purposes.

191. John Gimson, of Staleybridge, Lancaster, engineer, and George Gimson, of the same place, engineer. An improved apparatus applicable to steam pipes used for the purposes of heating and drying, which said apparatus may also be used for other similar purposes where steam is employed.

192. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in air beds, mattresses, and cushions. A communication from J. C. L. Jacob, of Paris, France, manufacturer.

193. George Brooks Pettit and Henry Fly Smith, of Oxford-street, Middlesex, gas engineers. Improvements in gas heating apparatus.

194. David Fisher, of Ranelagh-road, Thames-bank, Middlesex. Improvements in machinery for pressing, cutting, drying, and opening tobacco.

Dated January 25, 1856.

196. Alexandre Tolhausen, of Duke-street, Adelphi, Middlesex, interpreter at the Imperial Court of Paris. An improved machine for boring and other cutting operations in stone and other mineral substances of similar character. A communication from H. Rees, J. Loudon, and O. Ahlstrom, manufacturers, New York, United States.

198. Andrew Shanks, engineer, Robert-street, Adelphi, Westminster, and Francis Herbert Wenham, engineer, Effra-vale Lodge, Brixton, Surrey. Certain improvements in water gauges.

200. John Kershaw, of Stockport, Chester, manager. Improvements in apparatus for preventing the explosion of steam boilers.

202. Joseph Peak, of Manchester, Lancaster, smith and screw bolt manufacturer. Improvements in machinery or apparatus for pointing and turning bolt-heads, facing nuts, centreing, drilling, and similar purposes.

204. Alexander Dalgety, of Florence-road, Deptford, Kent, engineer. Improvements in vices, or gripping or holding apparatus.

206. William Owen, of the firm of Owen, Stodart, and Co., of Red Lion-square, Middlesex, pianoforte manufacturers. An improvement in pianofortes.

Dated January 26, 1856.

208. George Henry Ingall, of Old Broad-street, London, gentleman, and George Oscar Shaw Browne, of Glasshouse-street, Nottingham, machinist. An improved method of railway signalling.

210. George Napier, of Bath-street, Glasgow, Lanark, and Adelphi, Middlesex, engineer. Improvements in the construction and arrangement of the flues, air-passages, and other parts of furnaces, and also in controlling the passage of smoke, and in heating and regulating the supply of air to facilitate combustion.

212. Edward Vincent Gardner, of Norfolk-street, Middlesex Hospital. Improvements in heating, drying, desiccating, and evaporating.

214. Jean Louis Ambroise Huillard, of Paris, manufacturing chemist. Improvements in the processes of singeing and dressing textile fabrics, and in apparatus for the same.

216. Samuel Stratham, of Islington, Middlesex, gentleman. Improvements in electric telegraph conductors.

218. William Beasley, of Smethwick, Stafford, manufacturer. Improvements in machinery or apparatus to be employed in rifling the barrels of fire-arms and ordnance.

Dated January 28, 1856.

222. John Wormald, of Manchester, Lancaster, calenderer and packer. Certain improvements in machinery or apparatus for folding, "fenting," and making up goods or fabrics.

224. Augustin Magloire Jullienne, of Herblay, France, civil engineer. Improvements in brakes for railway trains.

226. Pierre Samain, of Meusnes, France, lock maker. Improvements in tables, stools, and other pieces of household furniture.

228. Robert Barrow, of Garford-street, Poplar, Middlesex, engineer. An equilibrium slide valve for steam engines.

230. William Asbury, of Birmingham, Warwick, engineer. A new or improved tap or stop cock.

232. John Whitehead, of Leeds, York, machine maker. Improved machinery for fulling cloth. A communication.

Dated January 29, 1856.

234. George Darlington, Minera, near Wrexham, Denbighshire. Producing oxide of zinc from its ores.

236. Daniel Foxwell, of Manchester, Lancaster, card manufacturer. Improvements in sewing machines.

238. Robert Thatcher, of Oldham, Lancaster, cotton spinner. Certain improvements in preparing for doubling or spinning cotton or other fibrous substances.

240. Owen Murrell, of Bethnal-green-road, Middlesex. Improvements in swing looking-glasses.

242. Henry Chance, of Birmingham, glass manufacturer. An improvement in the manufacture of moulded articles when using vitreous materials.

244. Joseph Fowell Walton, of Sarratt Hall, Rickmansworth, Herts, and Honore Le François, of Lambeth, Surrey. Improvements in cleaning forks, spoons, stewpans, and other culinary utensils.

246. Auguste Mathieu Maurice de Bergevin, of Rue Labat, Montmartre, Paris. Improvements in preparing coal for burning and in the furnaces employed in consuming such coal.

NOTICE OF APPLICATION FOR LEAVE TO FILE DISCLAIMER.

A petition has been presented to the Attorney-General, by Henry Henson Henson and Jeremiah Lorkin, for leave to file a disclaimer, and memorandum of alteration of parts of the specification of the patent granted to Henry Henson Henson, 15th April, 1848, for "Certain improvements in railway carriages and waggons, and in vessels of capacity employed in the storing and conveyance of explosive substances."

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," February 12th,* 1856.)

2174. William Neufville Martin. Improvements in the construction of folding and portable crates, boxes, baskets, packing-cases, and huts.

2191. John Riddel Musgrave, Robert Musgrave, and James Musgrave. Improvements in stoves for cooking and heating.

2209. Robert Wilkinson. Improvements in machinery or apparatus for carding cotton, wool, and other fibrous substances.

2216. Thomas Henry Ryland. A new or improved manufacture of bracelets and other dress ornaments and ornamental dress fastenings.

2221. Henry Brierly. Improvements in self-acting mules for spinning.

2229. Joseph Bennet Howell. Improvements in the manufacture of steel castings for ordnance and other purposes.

2230. Thomas Dickens. Improvements in machinery or apparatus for spinning, doubling, and throwing silk, and doubling other fibrous materials.

2231. Eliza Caroline Wren. An improved construction of child's cot.

2233. William John Roffe. Improvements in stoves or furnaces.

2255. Julien François Belleville. An improved smoke-consuming apparatus.

2289. Hugh Greaves. Improvements in the construction of steam boilers.

2307. Lewis Normandy. Improvements in the mode of writing and printing music, to facilitate the study thereof. A communication.

2339. John Cheeseman Wagstaff. Improvements in the manufacture of seamless garments and other seamless fabrics. Partly a communication.

2342. William Tatham. Improvements in machinery or apparatus for preparing, spinning, doubling, and winding cotton, wool, flax, silk, or other fibrous substances.

2386. Alfred Ardouin. A corking and capsuling machine.

2456. James Smith Cottrill. Improvements in machinery or apparatus for washing, scouring, dyeing, sizing, and cleaning woven fabrics and yarns.

2554. William Webb and John Webb, jun. Improvements in attaching door knobs to spindles.

2825. Alfred Krupp. Improvements in railway and other wheels, and in the method of and machinery for manufacturing the same.

2836. George Coats. Improvements in horse-shoes and in attaching the same to the horses' feet.

2874. Henry Robert Abraham. Improvements in carriages and in certain appurtenances and appendages which belong to those used as hospital conveyances or ambulances.

2928. Alfred Krupp. Certain improvements in guns and gun carriages.

19. James Bagster Lyall. Certain improvements in carriages.

53. Samuel Cunliffe Lister and William Tongue. Improvements in machinery for combing wool, cotton, and other fibrous materials.

79. John Erskine. The application of a new material or mixture for dressing or sizeing textile fabrics or materials.

84. Thomas Charles Clarkson. A combination of certain materials for forming and making improvements in ship and other pumps, tubes, and which is also applicable for ship, carriage, and other building purposes and parts thereof.

115. Vincent Scully and Bennett Johns Heywood. Improvements in the construction of inkstands, applicable in part to other vessels for the reception of fluids.

117. John Hamilton, jun. Improvements in the posts or uprights employed in constructing electric telegraphs.

127. James Jackson. An improved apparatus for retaining and releasing cords of "Venetian blinds," or cords, bands, or chains employed for other purposes.

129. William Chapman. An improvement in propelling vessels.

138. Henry Griffith Rule. Certain improvements in machinery or apparatus for measuring water or other fluids.

141. Nathaniel Shattswell Dodge. Improvements in treating vulcanized India rubber or gutta percha. A communication.

149. Edward Pickering. Improvements in the permanent way of railways.

182. Archibald Turner. Improvements in the manufacture of elastic fabrics.

200. John Kershaw. Improvements in apparatus for preventing the explosion of steam-boilers.

214. Jean Louis Ambroise Huillard. Improvements in the processes of singeing and dressing textile fabrics, and in apparatus for the same.

232. John Whitehead. Improved machinery for fulling cloth. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

334. Richard Archibald Brooman.
335. Auguste Edouard Loradoux Bellford.
360. George Hutchison.
374. George Henry Bursill.
412. William Bridges Adams.
472. Thomas Browne Jordan.
545. Robert Craib Ross.

LIST OF SEALED PATENTS.

Sealed February 8, 1856.

1792. Benjamin Williamson Pycock.
1806. Thomas Sleight.
1814. Edward Finch.
1815. Edward Finch.
1823. Thomas Hewitt.
1829. Alexander Cameron Morrison.
1830. Edmund Topham.
1832. William John Gregory.

1836. Robert Blackburn and William Lundi Duncan.
1868. Jean Jacques Danduran.
1870. David Brown and Jeremiah Brown.
1882. Francis Journeaux.
1883. William Soelman.
1907. Victor Fouchier.
1937. Emile Constantin Fritz Sautelet.
2063. Francis Gybbon Spilsbury and Frederick William Emerson.
2072. Jules Albert Hartmann.
2201. George Tomlinson Bousfield.
2249. Perceval Moses Parsons.
2436. Richard Reeves Cox.
2444. Lewis Normandy.
2538. William Kemble Hall.
2542. John Yuil Borland.
2565. Joseph Robinson.
2568. George Tomlinson Bousfield.
2728. Jean Davoust.
2747. Ebenezer Poulson.
2808. George Heron Hay and David Syme Hay.
2835. Ebenezer Rogers.

Sealed February 12, 1856.

1833. Walter Hancock.
1838. Albert Thornton and Frederick Thornton.
1842. George Shears.
1864. William Fawcett and Francis Best Fawcett.
1866. William Maynes.
1939. Samuel Ludbrook.
1964. Paul Eugène Charton.
2006. James Henry Bull.
2120. John Palmer.
2154. Matthew Atkinson and Benjamin Ridge.
2558. William Foster.
2646. Samuel Cunliffe Lister and James Warburton.

NOTICES TO CORRESPONDENTS.

C.—Your communication shall receive early attention.

Cosmopolitus.—The principal cause of the non-insertion of the papers you refer to was that we are able to appropriate to mathematics but a small amount of space. They, with several others, were therefore laid aside. If, however, space can shortly be found for them, or either of them, your desire shall be complied with.

H. Teague.—If Mr. Aldridge's invention is covered by Mr. Parkinson's patent, Mr. Parkinson can, of course, if he pleases, stop the working of Mr. Aldridge's patent.

CONTENTS OF THIS NUMBER.

Improved Blast Engines (*with engravings*) 145
London Fires in 1855. By Mr. W. Baddeley, C.E., &c. 148
Faraday's Experimental Researches in Electricity (*continued from page* 103) 153
Pugh's Fire Projectiles (*with engravings*) 157
Surplus from Patent Office Fees 158
Specifications of Patents recently Filed:
Vermeersch ......Looms 159
Palmer ......Carding Machines 159
Kopp ......Mordants 159
Brooman ......Wheels and Axles 159
Pratt ......Steam Mills 160
Nalder ......Grain and Seeds 160
Wilson ......Boards for Piece Goods 160
Hart ......Lace 160
Coulson ......Ventilation 160
Jeffreys ......Sun-Blinds 161
Treeby ......Fire-Arms 161
Jeffreys ......Steam Boilers 161
Adams ......Indicating Time 161
Bielefield ......Saddle-trees 161
Williams ......Bricks, &c. 161
Greening ......Washing and Mangling 161
Robinson and Wedding ......Cutting Paper 161
Bethell ......Preserving Food 162
Edwards ......Motive Power 162
Chattaway ......Buffing and Coupling Apparatus 162
Caldow and M'Kinnell ......Cutting Vegetables 162
Simons ......Consuming Smoke 162
Obissier ......Motive Power 162
Tuck ......Condensing Fluids 162
Redmayne ......Stove Grates 163
Lister ......Piled Fabrics 163
Bousfield ......Boots and Shoes 163
Cochran ......Clay 163
Hornsby ......Thrashing-Machines ... 163
Yates ......"Lock" and "Lever" Knives 163
Koch ......Wood Pulp 163
Pollesse and Lengelée ......Encaustic Matters 164
Provisional Specifications not Proceeded with:
Johnson ......Organs, Pianos, &c. ... 164
Johnson ......Permanent Way 164
Weston and Lewis ......Moderator Lamps 164
Higgin ......Dyed and Printed Fabrics 164
Gillett ......Artificial Teeth 164
Lawton and Schofield ......Fibrous Substances 164
Brooman ......Pumps 165
Burns ......Toothed Wheels 165
Grafton ......Fire-lights 165
Provisional Protections 165
Notice of Application for Leave to File Disclaimer 167
Notices of Intention to Proceed 167
Patents on which the Third Year's Stamp Duty has been Paid 167
List of Sealed Patents 167
Notices to Correspondents 168

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1698.] SATURDAY, FEBRUARY 23, 1856. [PRICE 3D

Edited by R. A. Brooman, 166, Fleet-street.

ULLMER'S PATENT PAPER-CUTTING MACHINE.

Fig. 1.

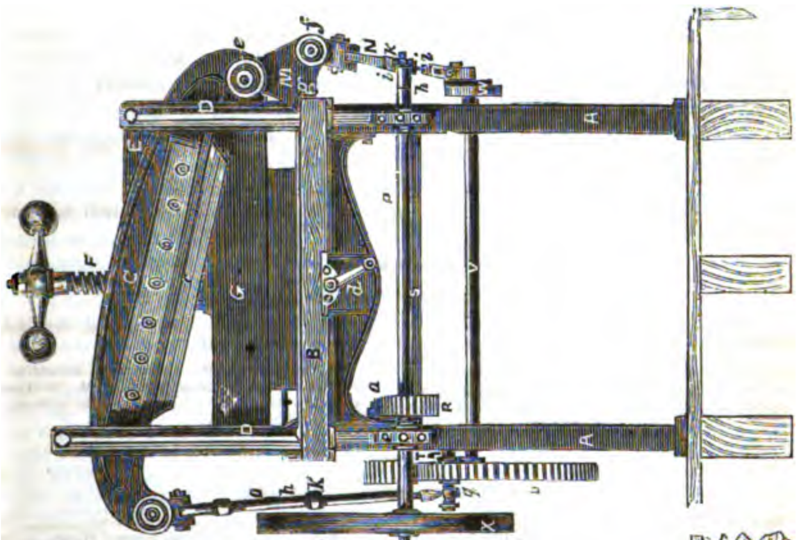
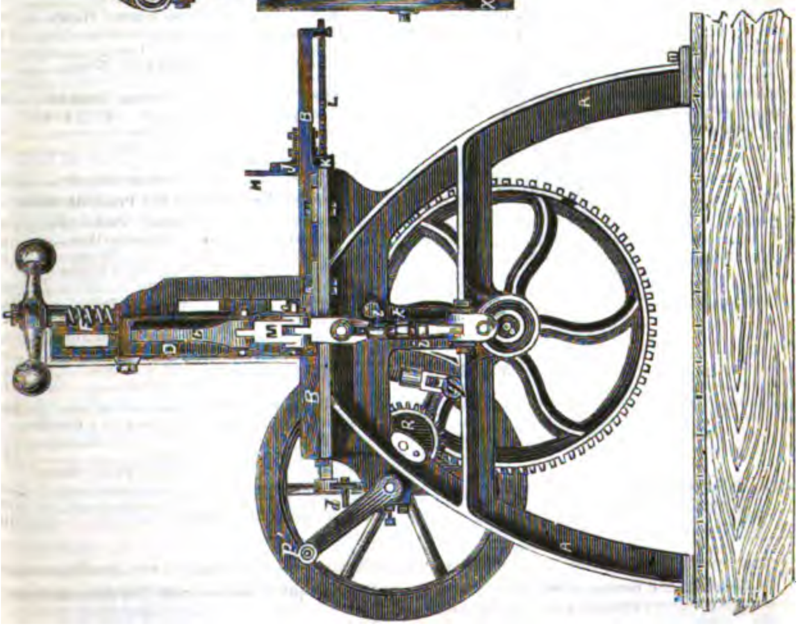


Fig. 2.



ULLMER'S PATENT PAPER-CUTTING MACHINE.

(Patent dated August 10, 1855.)

Messrs. Ullmer, of Fetter-lane, London, have just patented some very useful improvements in machines for cutting paper, card, and mill-boards, and other like substances, which improvements consist in certain methods of imparting to the knives of such machines a diagonal or draw cut, and also in a means of raising and lowering the knife.

Fig. 1. of the engravings on the preceding page is a front elevation of one of Messrs. Ullmer's paper-cutting machines, and fig. 2 a side view. A A is the frame; B the platform or table; C the knife lever; *c c* cutting-blade secured to the knife lever by bolts and nuts; D D guides for the knife to work in; E cross-bar, secured to the guides, D D; F screw working through the centre of the cross-bar, and carrying a platten, G, which is free to rise and fall in slots in the back of the guides, D D. H is a gauge or stop connected to the sliding bracket, J, which is fixed by screws descending through a slot in the platform, B, to a similar bracket beneath the platform; on one end of this bracket is formed a nut, K. L is a screwed shaft which works under the table of the machine, and through the nut, K; the slot formed in the table allows the block, I, to move forward or backward according to the motion imparted to the nut by the screwed shaft; *d* is a winch handle for turning the rod. M is a bell crank connected at *e* by a pin to one end of the knife lever which it supports, and at *f* to an adjustable connecting rod, N, united to a crank on the end of the shaft of the main spur wheel as hereafter described; the fixed centre of the bell crank is at *g*, where it is connected to the frame of the machine by a pin, about which it is free to oscillate. The opposite end of the knife lever is supported upon another adjustable connecting rod, O, united to a crank formed by a pin and one of the arms of the main spur wheel. Both connecting rods are formed with a bar, *h h*, threaded with a right-hand thread on one end, and a left-hand thread on the other, which work into two threaded sockets. *i i*, *k k*, are parts forged on the bars, *h h*, in the shape of nuts for turning them, and thereby raising or lowering either end, or both ends of the knife, as required. P is a shaft supported in bearings in the frame, driven by a winch handle, P^1 (not shown in fig. 1). Q is a pinion on the shaft, P, which gears into a toothed wheel, R, on another shaft, S. T is another pinion on the outer end of this shaft, which gears into and drives the main spur wheel, U, keyed on a shaft, V, the opposite end of which carries a crank, W, to which the connecting rod, N, is affixed. *q* is a pin on one of the arms of the spur wheel, U, to which the connecting rod, O, is affixed. A crank is thus formed on both ends of the shaft, V, to which the connecting rods, N and O, are affixed. X is a fly-wheel on the driving shaft, P.

The operation of the machine is as follows:—The paper, card, or other board to be cut is placed upon the table, and pushed back against the stop or gauge; the screw, F, is turned down, and the platten thereby depressed on to the paper, just behind the path of the knife whereby the paper is held tight. The winch handle is then turned, and through the gearing cranks and connecting rods the knife is brought down in a slanting direction, and caused to make a diagonal drawing cut. Continuous rotation in the same direction causes the knife alternately to rise and descend, performing at each descending stroke a diagonal drawing cut.

LONDON FIRES IN 1855.*

Twenty-fifth Annual Report. By Mr. William Baddeley, C.E., Inventor of the Portable Canvas Cisterns, Improved Jet-spreaders, Farmer's Fire-engine, &c., &c.

(*Concluded from page* 153.)

The following tabular analysis exhibits, in each instance, the occupancy of that part of the premises in which the fire originated, illustrating the comparative liability to accident by fire of various trades, manufactories, and private dwellings:

* Errata in first portion of Fire Report (see last week's No.) Page 149, seventh line from bottom, for 'High-street, Southwark," read "High-street, Shoreditch." Page 150, eighth line from bottom, for '300" read "301." Page 152, twenty-ninth line from bottom, for "falling," read "fallen."

Occupation.	Totally Destroyed.	Seriously Damaged.	Slightly Damaged.	Total.
Apothecaries, not having laboratories..	1	4	3	8
Arsenal	—	1	—	1
Bakers	—	6	15	21
———, pie	—	1	1	2
———, sea biscuit..	—	1	—	1
Basket-makers	—	1	1	2
Beer-shops	—	6	9	15
Booksellers, binders, and stationers ..	1	8	9	18
Brokers, and dealers in old clothes ..	1	7	6	14
Builders	3	7	5	15
Butchers	—	1	3	4
Cabinet-makers	2	9	15	26
Cane-dyer	—	1	—	1
Caoutchouc manufacturers	—	2	—	2
Carpenters, and other workers in wood	2	17	25	44
Chandlers	—	4	12	16
————, corn	2	3	2	7
————, ship	—	—	2	2
Charcoal dealer	—	1	—	1
Cheesemongers	—	1	4	5
Chemists, using laboratories	—	3	1	4
Churches and chapels	—	1	5	6
Coachmakers	—	1	2	3
Cocoa-nut fibre manufacturer	—	—	1	1
Coffee-roaster	—	1	1	2
Coffee-shops and chop-houses	—	8	12	20
Colour manufacturers	—	2	2	4
Confectioners	—	4	7	11
Cork-cutters	—	1	1	2
Coopers	1	2	—	3
Currier and leather-dresser	—	—	1	1
Distillers	1	1	1	3
————, illicit	—	1	1	2
————, naphtha	1	1	1	3
————, tar	—	—	2	2
Docks	—	1	1	2
Drapers, linen, woollen, and mercers ..	1	18	10	29
Druggist, wholesale	—	1	—	1
Drysalters	—	2	1	3
Dyers	—	2	—	2
Eating-house keepers	—	1	6	7
Engineers, mechanical	1	1	2	4
Feather-dresser	—	1	—	1
Firework-maker	—	1	—	1
Founders	—	2	1	3
Fruiterer	—	—	1	1
Furriers and skin-dyers	—	2	1	3
Gas-works	—	1	2	3
Glass-blower	—	1	—	1
Glass and emery paper-maker	1	—	—	1
Glue manufacturer	—	1	—	1
Granary keeper	—	—	1	1
Grocers	2	5	7	14
Hat-makers	—	5	2	7
Hop-merchants	—	—	2	2
Horsehair-merchants	—	1	1	2
Hotels and club-houses	—	—	4	4

Occupation.	Totally Destroyed.	Seriously Damaged.	Slightly Damaged.	Total.
Japanners	—	2	1	3
Laundresses	—	2	2	4
Leather, patent, manufacturer	—	1	—	1
Lucifer-match-makers	—	2	1	3
Maltsters	—	1	1	2
Manure, dealers in	—	—	2	2
Marine stores, dealers in	1	3	6	10
Mast and block-makers	—	—	3	3
Mill, steam flour	1	—	—	1
Milliners and dressmakers	1	2	3	6
Musical instrument-makers..	—	2	1	3
Oil works	—	1	—	1
Oil and colourmen	—	6	7	13
Painters, plumbers, and glaziers.. ..	—	3	2	5
Paper-stainers	—	—	3	3
Pasteboard-maker..	—	1	—	1
Pawnbrokers	—	2	—	2
Perfumer	—	1	—	1
Pipe-maker	1	—	—	1
Pork-butchers	—	1	3	4
Printers, letter-press	—	—	4	4
———, copper-plate	—	—	2	2
———, calico	—	1	—	1
Prison	—	—	1	1
Private dwellings	2	54	215	271
Provision merchants	—	2	2	4
Public buildings	—	—	2	2
Rag-merchants	—	1	2	3
Railways	—	1	2	3
Rope-makers	1	2	3	6
Sack-makers	—	1	1	2
Sale-shops and offices	1	16	39	56
Saw-mills, steam	2	2	1	5
Schools	—	1	2	3
Ship-builders	—	1	1	2
Ships	—	1	6	7
——, steam	—	1	—	1
Soot merchant	—	—	1	1
Stables	—	3	13	16
Sugar refiner	—	1	—	1
Tailors	—	3	9	12
Tallow-melters, wax-chandlers, and soap-boilers	—	4	—	4
Tinmen, braziers, and smiths	1	5	10	16
Timber-merchants..	—	1	3	4
Tobacconists	—	4	4	8
Toy-warehouses	—	1	2	3
Umbrella-makers	—	3	—	3
Under repair, or building	3	4	9	16
Unoccupied	1	1	1	3
Upholsterers	—	3	5	8
Varnish-makers	—	1	2	3
Victuallers, licensed	1	16	27	44
Warehouses	—	3	3	6
—————, Manchester	—	1	3	4
Waterproof canvas-makers	—	5	—	5
Weavers	—	1	2	3

Occupation.	Totally Destroyed.	Seriously Damaged.	Slightly Damaged.	Total.
Weavers, mat..	—	1	—	1
Wharfingers	—	3	6	9
Wine and spirit merchants	—	2	4	6
Workshop, not hazardous	—	1	—	1
Total	36	334	614	984

The daily distribution of last year's fires was as follows:

Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	Sunday.
137	140	147	149	143	136	132

Their distribution through the hours of day and night have been in the following proportion:

	First hour.	Second hour.	Third hour.	Fourth hour.	Fifth hour.	Sixth hour.	Seventh hour.	Eighth hour.	Ninth hour.	Tenth hour.	Eleventh hour.	Twelfth hour.
A.M.	67	60	44	32	44	30	11	18	19	20	23	21
P.M.	24	21	31	25	40	43	52	65	75	76	82	59

The *causes of fire*, so far as could be satisfactorily ascertained, have been the following:

Accidents, unforeseen, and for the most part unavoidable	7
Apparel, ignited on the person	7
Areas, fire thrown down	9
Candles, various accidents with	95
„ ignited bed-curtains	69
„ „ window-curtains ..	37
Carelessness, palpable instances of ..	11
Charcoal, hot	1
Children, playing with fire	4
„ „ „ lucifers ..	6
„ „ „ gunpowder..	1
Cinders, put away unextinguished ..	15
Coke, put away hot	2
Copper, portable	1
„ defective	3
„ flues, defective	13
Fire-sparks	68
„ kindled on hearths	9
Fireworks, letting off	3
Flues, foul and ignited	31
„ defective and overheated . ..	42
„ blocked up	7
„ hot air	4
Friction of machinery	2
Fumigation, incautious	3
Furnaces, heat of	23
Gas, escape of, from defective fittings.	79
„ burning too high	19
„ accidents in lighting	4
Hearths, defective	6
Hot-plate	4
Hot-water pipe, heat from	1
Intoxication	11

Lamps, oil	9
" naphtha	4
Lime, slaking	6
Linen, drying or airing before fire	30
Locomotives, sparks from	7
Lucifer matches, accidents in making	2
" " " " using	7
" " accidentally ignited	13
Naphtha, distilling	2
" accidentally ignited	4
" vapour of, accidentally ignited	1
Oil, boiling of	5
Ovens, defective and overheated	10
Pitch and tar, heating of	5
Reading in bed	1
Sealing-wax, melting	1
Shavings, loose ignited	29
Smoking meat	1
Spontaneous ignition of coals	1
" " cotton waste	3
" " flocks	1
" " greasy rubbish	3
" " hay	1
" " lamp-black	7
" " phosphorus	1
" " rags	2
Steam-boilers, heat from	10
Stills, illicit	2
Stoves, improperly set, defective, or overheated	35
" charcoal	2
" drying	13
" gas	2
" ironing	2
" pipe	8
Sugar boiling	1
Suspicious	17
Tobacco, unextinguished	35
Wilful	23
	903
Unknown	79
	982

Not only in the number of fires last year, as compared with the preceding, is there a remarkable uniformity, but the same uniformity obtains in a very remarkable manner with reference to the *causes*, some of them being precisely the same, and but very few presenting a wide difference; strikingly confirming the remark of a writer in the *Quarterly Review*:*—"Among the more common causes of fire (such as gas, candles, curtains taking fire, children playing with fire, stoves, &c.), it is remarkable how uniformly the same numbers occur under each head from year to year. General laws obtain as much in small as in great events." In the case of "linen airing before fire," two of the accidents were caused by kittens climbing on the clothes-horse, and upsetting it into the fire. In two cases, also, the "accidental ignition of lucifers" was occasioned by cats throwing down a pile of boxes. The continuous heavy rain the last week of October occasioned one fire by "slaking lime." The wilful fires of the year have been numerous, while several of them have, no doubt, been the result of vindictive feelings; others appear to have had no other object than getting up a conflagration, for the sake of the trifling advantages to be derived from the few shillings paid for working the engines, property to the amount of many thousand pounds being recklessly jeopardized for this object; and it is much to be regretted that it has not been possible to bring this crime home to any of the perpetrators.

The new steam floating fire-engine, described at page 365 of your last volume, has been completed, and placed at the moorings off Southwark-bridge. The former steam floating engine, after being thoroughly repaired, will be placed in the station off King's-stairs, Rotherhithe, and the hand-worked engines on the river will have become things of the past.

In Mr. Braidwood's report to the Committee of Managers of the London Fire Establishment, he states that the speed of the new floating-engine, with the jet propeller, was, "at the second trial in Long Reach, above eight miles per hour; and I have no doubt that when the machinery gets more into use (and we know better how to work the new principle of propulsion), that her speed will be considerably increased. The fire-engines work beautifully; their estimated power was 1,428 gallons of water per minute. At a late trial, they threw 1,938 gallons per minute, through four 1¼-inch jets, to a height of 116 feet, with a fresh breeze blowing at the time; and there was power to spare, which would have been put on, but for fear of bursting the hose. The steam-engines, also, work well. The nominal power is 80-horse, but they have been worked up to 180-horse, per indicator, with only 90 lbs. pressure of steam. They can be, however, worked safely to 120 lbs., the boilers having been proved to upwards of 200 lbs. pressure."

The Building Act of the 7th and 8th of Queen Victoria contains the important enactment that "no warehouse shall exceed 200,000 cubic feet in contents." "Fire," observes the writer before quoted, "becomes unmanageable when it has access to large stores of combustible matter; under such circumstances it acquires a 'fortified

* December, 1854.

position,' and cannot, in the vast majority of cases, be reduced unless by an early surprise. As the very heart of London is largely occupied with Manchester warehouses full of the most inflammable materials, the safety of the capital depends upon this restrictive law. The Manchester warehousemen, nevertheless, have managed to set that part of the Act at defiance. 'We escape altogether,' say these gentlemen, 'the provisions of the Building Act relative to warehouses as, by reason of our breaking bulk, our places of business are not mere storehouses.'" By the 18th and 19th of Victoria, cap. 122, however, this evasion has been got rid of; clause 27 limits the areas of buildings, enacting that "Every warehouse, or other building used either wholly or in part for the purposes of trade or manufacture, containing more than 216,000 cubic feet, shall be divided by party walls in such manner that the contents of each division thereof shall not exceed the abovementioned number of cubic feet." The same Act also contains the following wholesome provisions:—"No pipe for conveying heated air or steam shall be fixed nearer than 6 inches to any combustible material. No pipe for conveying hot water shall be placed nearer than 3 inches to any combustible materials. No pipe for conveying smoke or other products of combustion shall be fixed nearer than 9 inches to any combustible material." Another trial of the "*Fire Annihilator*," took place at Woolwich last year, but like the former ones at the same place, it proved unsuccessful. It seems to be the singular fate of this invention, to fail as an *experiment*, while it is almost always successful in *practice!*—a result only to be accounted for, upon the supposition that the practical applications are *legitimate*—that the experimental trials are not so; and this is pretty near the truth of the matter.

Mr. Superintendent Braidwood reports, "the conduct of the firemen as all that could be wished," and feels compelled to mention "the very able and efficient services of the foremen, Messrs. Colf, Fogo, Henderson, and Staples;" an expression of approbation which the committee of management very handsomely endorsed, by a permanent addition to their salaries.

13, Angell-terrace, Islington,
Jan. 31, 1856.

ON THE HARMONY OF THEORY AND PRACTICE IN MECHANICS.

BY PROFESSOR W. J. MACQUORN RANKINE, C.E., F.R.S.S., L. AND E., ETC.*

The evil influence of the supposed inconsistency of theory and practice upon speculative science, although much less conspicuous than it was in the ancient and middle ages, is still occasionally to be traced. This it is which opposes the mutual communication of ideas between men of science and men of practice, and which leads scientific men sometimes to employ, on problems that can only be regarded as ingenious mathematical exercises, much time and mental exertion that would be better bestowed on questions having some connection with the arts, and sometimes to state the results of really important investigations on practical subjects in a form too abstruse for ordinary use; so that the benefit which might be derived from their application is for years lost to the public; and valuable practical principles, which might have been anticipated by reasoning, are left to be discovered by slow and costly experience.

But it is on the practice of mechanics and engineering that the influence of the great fallacy is most conspicuous and most fatal. There is assuredly, in Britain, no deficiency of men distinguished by skill in judging of the quality of materials and work, and in directing the operations of workmen—by that sort of skill, in fact, which is purely practical, and acquired by observation and experience in business. But of that scientifically practical skill which produces the greatest effect with the least possible expenditure of material and work, the instances are comparatively rare. In too many cases we see the strength and the stability which ought to be given by the skilful arrangement of the parts of a structure supplied by means of clumsy massiveness, and of lavish expenditure of material, labour, and money; and the evil is increased by a perversion of the public taste, which causes works to be admired, not in proportion to their fitness for their purposes, or to the skill evinced in attaining that fitness, but in proportion to their size and cost.

With respect to those works which, from unscientific design, give way during or immediately after their erection, I shall say little; for, with all their evils, they add to our experimental knowledge, and convey a lesson, though a costly one. But a class of structures fraught with much greater evils exist in great abundance throughout the country—namely, those in which the faults of an unscientific design have been so far counteracted by massive strength, good materials, and careful workmanship, that a temporary stability has been produced, but

* From the Introductory Lecture delivered to the Class of Civil Engineering and Mechanics in the University of Glasgow, January 3, 1856. (The whole of this able lecture has since been published by R. Griffin and Co., London and Glasgow.)

which contain within themselves sources of weakness, obvious to a scientific examination only, that must inevitably cause their destruction within a limited number of years.

Another evil, and one of the worst which arises from the separation of theoretical and practical knowledge, is the fact that a large number of persons, possessed of an inventive turn of mind and of considerable skill in the manual operations of practical mechanics, are destitute of that knowledge of scientific principles which is requisite to prevent their being misled by their own ingenuity. Such men too often spend their money, waste their lives, and it may be lose their reason in the vain pursuits of visionary inventions, of which a moderate amount of theoretical knowledge would be sufficient to demonstrate the fallacy; and for want of such knowledge, many a man who might have been a useful and happy member of society, becomes a being than whom it would be hard to find anything more miserable.

The number of those unhappy persons—to judge from the patent-lists, and from some of the mechanical journals—must be much greater than is generally believed. The most absurd of all their delusions—that commonly called the perpetual motion, or to speak more accurately, the inexhaustible source of power—is, in various forms, the subject of several patents in each year. One form of perpetual motion, of great antiquity, in which weights in descending from a certain height are expected to perform more work than is required to lift them to the same height again, was made the subject of two different patents in the course of the year which has just elapsed.

The ill-success of the projects of misdirected ingenuity has very naturally the effect of driving those men of practical skill, who, though without scientific knowledge, possess prudence and common sense, to the opposite extreme of caution, and of inducing them to avoid all experiments, and to confine themselves to the careful copying of successful existing structures and machines; a course which, although it avoids risk, would, if generally followed, stop the progress of all improvement. A similar course has sometimes, indeed, been adopted by men possessed of scientific as well as practical skill: such men having, in certain cases, from deference to popular prejudice, or from a dread of being reputed us theorists, considered it advisable to adopt the worse and customary design for a work in preference to a better but unusual design.

Some of the evils which are caused by the fallacy of an incompatibility between theory and practice having been described, it must now be admitted, that at the present time those evils show a decided tendency to decline. The extent of intercourse, and of mutual assistance, between men of science and men of practice, the practical knowledge of scientific men, and the scientific knowledge of practical men, have been for some time steadily increasing; and that combination and harmony of theoretical and practical knowledge—that skill in the application of scientific principles to practical purposes, which in former times was confined to a few remarkable individuals, now tends to become more generally diffused. With a view to promote the diffusion of that kind of skill, Chairs were instituted at periods of from fifteen to ten years ago, in the two Colleges of the University of London, in the University of Dublin, in the three Queen's Colleges of Belfast, Cork, and Galway, and in this University of Glasgow.

* * * *

It being admitted that theoretical and practical mechanics are in harmony with each other, and depend on the same first principles, and that they differ only in the purposes to which those principles are applied, it now remains to be considered in what manner that difference affects the mode of instruction to be followed in communicating those branches of science.

Mechanical knowledge may obviously be distinguished into three kinds; purely scientific knowledge, purely practical knowledge, and that intermediate kind of knowledge which relates to the application of scientific principles to practical purposes, and which arises from understanding the harmony of theory and practice.

The objects of instruction in purely scientific mechanics and physics are, first, to produce in the student that improvement of the understanding which results from the cultivation of natural knowledge, and that elevation of mind which flows from the contemplation of the order of the universe; and secondly, if possible, to qualify him to become a scientific discoverer. In this branch of study exactness is an essential feature; and mathematical difficulties must not be shrunk from when the nature of the subject leads to them. The ascertainment and illustration of truth are the objects; and structures and machines are looked upon merely as natural bodies are; namely, as furnishing experimental data for the ascertaining of principles and examples for their illustration.

Instruction in purely practical knowledge is that which the student acquires by his own experience and observation of the transaction of business. It enables him

to judge of the quality of materials and workmanship, and of questions of convenience and commercial profit, to direct the operations of workmen, to imitate existing structures and machines, to follow established practical rules, and to transact the commercial business which is connected with mechanical pursuits.

The third and intermediate kind of instruction, which connects the first two, and for the promotion of which this chair was established, relates to the application of scientific principles to practical purposes. It qualifies the student to plan a structure or a machine for a given purpose, without the necessity of copying some existing example, and to adapt his designs to situations to which no existing example affords a parallel. It enables him to compute the theoretical limit of the strength or stability of a structure, or the efficiency of a machine of a particular kind—to ascertain how far an actual structure or machine fails to attain that limit—to discover the cause of such shortcomings—and to devise improvements for obviating such causes; and it enables him to judge how far an established practical rule is founded on reason, how far on mere custom, and how far on error.

There are certain characteristics in the mode of treating the subjects, by which this practical scientific instruction ought to be distinguished from instruction for purely scientific purposes.

In the first place, it will be universally admitted, that as far as is possible, all mathematical intricacy ought to be avoided.

In the original discovery of a proposition of practical utility, by deduction from general principles and from experimental data, a complex algebraical investigation is often not merely useful, but indispensable; but in expounding such a proposition as a part of practical science, and applying it to practical purposes, simplicity is of the first importance: — and, in fact, the more thoroughly a scientific man has studied the higher mathematics, the more fully does he become aware of this truth—and, I may add, the better qualified does he become to free the exposition and application of scientific principles from mathematical intricacy. I cannot better support this view than by referring to Sir John Herschel's "Outlines of Astronomy" — a work in which one of the most profound mathematicians in the world has succeeded admirably in divesting of all mathematical intricacy the explanation of the principles of that natural science which employs the higher mathematics most.

In fact the symbols of algebra, when employed in abstruse and complex theoretical investigations, constitute a sort of thought-saving machine, by whose aid a person skilled in its use can solve problems respecting quantities, and dispense with the mental labour of thinking of the quantities denoted by the symbols, except at the beginning and the end of the operation. In treating of the practical application of scientific principles, an algebraical formula should only be employed when its shortness and simplicity are such as to render it a clearer expression of a proposition or rule than common language would be, and when there is no difficulty in keeping the thing represented by each symbol constantly before the mind.

Another characteristic by which instruction in practical science should be distinguished from purely scientific instruction, is one which appears to me to possess the advantage of calling into operation a mental faculty distinct from those which are exercised by theoretical science. It is of the following kind:

In theoretical science, the question is—*What are we to think?* and when a doubtful point arises, for the solution of which either experimental data are wanting, or mathematical methods are not sufficiently advanced, it is the duty of philosophic minds not to dispute about the probability of conflicting suppositions, but to labour for the advancement of experimental inquiry and of mathematics, and await patiently the time when they shall be adequate to solve the question.

But in practical science, the question is —*What are we to do?*—a question which involves the necessity for the immediate adoption of some rule of working. In doubtful cases, we cannot allow our machines and our works of improvement to wait for the advancement of science; and if existing data are insufficient to give an exact solution of the question, that approximate solution must be acted upon which the best data attainable show to be the most probable. A prompt and sound judgment in cases of this kind is one of the characteristics of a PRACTICAL MAN, in the right sense of that term.

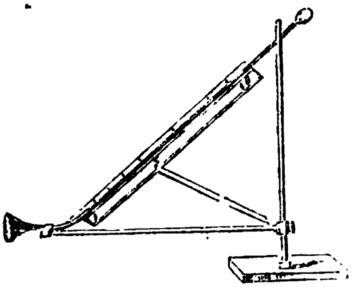
A NEW SPHYGMOSCOPE,

OR INSTRUMENT FOR INDICATING THE MOVEMENTS OF THE HEART.

A paper, communicated by G. O. Rees, M.D., F.R.S., descriptive of a new sphygmoscope, or instrument for indicating the movements of the heart and blood-vessels, was recently read before the Royal Society, by S. Scott Alison, M.D., &c.

The sphygmoscope consists of a small chamber containing spirits of wine or other

liquid, provided with a thin India-rubber wall, where it is to be applied to the chest. At the opposite extremity the chamber communicates with a glass tube, which rises to some height above the level of the chamber. Liquid is supplied to the instrument until it stands in the tube a little above the level of the chamber. The pressure of the column of liquid in the tube acts upon the elastic or yielding wall of India-rubber and causes it to protrude. This protruding part or chest-piece is very readily affected by external impulse; it yields to the slightest touch, and being pushed inwards, causes a displacement of the liquid in the non-elastic chamber, and forces a portion of liquid up the tube. The protruding wall of India-



rubber is driven inwards when it is brought in contact with that portion of the chest which is struck by the apex of the heart, and a rise in the tube takes place. When the heart retires, the India-rubber wall, affected by the pressure of the column of liquid in the tube, is pressed back, follows the chest, and permits the liquid to descend. The degree to which the India-rubber wall is forced in by the apex of the heart is denoted by a corresponding rise in the tube, and the amount of protrusion of the India-rubber wall which takes place when the heart retires is denoted by a corresponding fall in the tube. The tube is supplied with a graduated scale to denote the rise and fall with exactitude. The glass tube is provided at the top with some contrivance, such as a brass screw and collar, to prevent the egress of the liquid when the instrument is not in use, or a bulb with an orifice may be supplied. When employed, the glass tube is left open to permit of the passage of the air to and fro.

The sphygmoscope is mounted upon a stand. The chamber and tube are fitted to a horizontal arm, which is made to move up and down so as to carry the instrument to the desired height. The base is so made as to secure the requisite immobility.

The glass tube is a foot or more long, and the round bore is about the one-eighth part of an inch. If the bore be much larger, the movement will be inconsiderable; if much less, capillary attraction will interfere and prevent free motion.

When the instrument is to be employed, mounted upon its stand, it is placed upon a firm table with the chamber projecting beyond it. The person whose heart is to be examined is seated upon a firm chair, with his chest erect and free from motion.

The duration of the impulse of the heart upon the chest is well measured by this instrument: the time occupied by the rise is the time occupied by the impulse.

The instrument, placed upon the heart, indicates strokes of that organ which are so feeble as to have no corresponding pulse at the wrist.

No pause whatever in the movement of the liquid has been at any time observed when the sphygmoscope has been carefully placed so as to receive the full beat, and fall back with freedom. This would go to show that the heart, however slow, is in constant motion, and, contrary to the belief of many physiologists, enjoys no pause.

The sphygmoscope indicates with exactitude both the absolute and the comparative influence upon the heart, of food, cordials, stimulants, and tonic medicines. It does the same in respect to depressing causes, such as hunger, cold, and sedatives.

With the aid of this instrument the fact is demonstrated that the action of the heart may be great when the pulse is small. It is found also that, while cold at the surface and extremities may depress the pulse, the heart may remain little enfeebled, or even become excited, and that warmth and friction applied to the extremities may cause an excited pulse without there being any accompanying increased force of the heart.

The sphygmoscope reduced, deprived of its stand, having a level elastic wall instead of protruding one, and having a glass tube with an almost capillary bore, forms a remarkably delicate indicator of the pulse. It is so delicate in its impressions that it is appreciably affected by the regurgitant wave in the jugular veins, and by the wave in arteries greatly smaller than the radial. From its nicety in manifesting the beat of the blood-wave, it is very valuable, and is called the hand-sphygmoscope.

By means of this hand instrument applied to the arteries, a comparison is readily made between the time of the beat of the heart and the rise of the arteries under the influence of the blood-wave.

FISKEN'S PATENT AGRICULTURAL APPARATUS.

(Patent dated July 19, 1855.)

One of the most promising arrangements of apparatus for applying steam power to agricultural operations is that recently brought forward by Messrs. D. and T. R. H. Fisken, of Stockton-on-Tees, and which consists in transmitting from a steam engine or other suitable prime mover, in the manner hereafter described, the necessary power for working two, four, or more ploughs, or other agricultural implements used in the tillage of land, and which are required to traverse over the whole surface of the land; also, in constructing the machinery hereafter described for applying the power so transmitted.

The ploughs or other implements employed are supported in the extremities of forked levers which are connected to a slotted lever by a bell crank and connecting rod, by means of which the implements are alternately raised out of, or lowered into the land, so that while one set is in action, the set on the opposite side of the bell crank is out of work. The power for raising and lowering the ploughs is communicated through an endless screw, which gears into a toothed quadrant carried upon the axis of the slotted lever. The power from the steam engine or other prime mover is transmitted to the machine by an endless rope of a sufficient length to suit the length of the field and the distance of the motive-power engine. This rope passes under a small guide pulley or sheave, and over a large driving wheel, upon the axis of which are keyed two toothed pinions, in one of which a less number of teeth is cut than in the other. These pinions gear into other and similar pinions, and serve to impart motion to a spur wheel, upon the axis of which is keyed a drum, round which a strong wire rope or chain is partially wound. This wire rope or chain, after passing under two guide pulleys, is fastened at each end to anchors constructed for the purpose, and placed at opposite sides of the field or piece of land to be ploughed or otherwise operated upon.

When the endless rope is set in motion, the resulting action of the drum against the wire rope or chain causes the machine with the ploughs or other implements to be drawn across the field. When the machine has arrived at one side of the land and the furrows are ploughed, then that set of ploughs which has been in work is raised out of the ground, and the whole machine is shifted aside through a distance equal to the breadth of the ploughs in work; that is to say, if there are two series of ploughs used on each side of the machine, then the machine is shifted the breadth of two furrows, and the opposite set of ploughs is lowered into the land. Then by reversing the revolution of the spur wheel by a suitable arrangement of reversing gear hereinafter described, the drum carrying the wire rope or chain is caused to revolve in the opposite direction, and the ploughs or other implements are caused to traverse to the other side of the piece of land. The action of the machine is then again reversed and again caused to traverse to the opposite side of the land, and so on until the whole or any required portion of the land is worked. The platforms of the anchors have fixed to them hollow iron pillars, in which revolve light upright spindles, having on the top of them sheaves or pulleys, round which the endless rope passes. At about the central part of the anchor platform is a small capstan barrel, to which the wire rope is attached. On the axis of this barrel is keyed a ratchet wheel into which a pall takes for the purpose of keeping the wire rope always tight. A winch, driven by power transmitted from the prime mover, as hereafter explained, is used to transport the anchor so as to keep the endless hemp cord and the wire rope always opposite to the machine while the latter is travelling. The lower part of the anchor is sunk in a furrow, while a long piece of timber, which carries the hind bearing wheels, projects on that side of the anchor which is towards the land under operation, and serves to steady the anchor. The bearing wheels are placed at each end of the anchor to prevent it, when being shifted, from digging into the land. A small flying capstan is used for taking up the slack of the endless hemp rope. In order to steer the ploughing machine we make use of guide wheels, worked by an eccentric or otherwise, so as to incline the axes of the wheels according to the direction in which it is desired to guide the machine.

HEWITT'S PATENT IMPROVEMENTS IN PUMPS.

(Patent dated July 24, 1855.)

The object of this invention is to remedy the inconveniences experienced in sinking shafts where water is found in such quantities as to render the use of pumps indispensable. According to one arrangement that has heretofore been adopted in some cases, a telescopic pipe is introduced underneath the clack at the slide-gland, thus causing much delay in the sinking. This is what is called a slide-lift. When with this arrangement a fresh length of pipe has to be put on, the slide-gland is then not

less than 19 feet below the bucket, and this accounts for its causing the extra labour in the sinking, it being necessary to clay the slide-gland to prevent the air from entering through it.

Another arrangement is also used during sinking, called a running lift. In this arrangement the pipes are put on at the top, and the whole column of pipes sinks with the bottom of the shaft. When a nine-feet pipe is put on, the delivery of the water must take place at least 14 feet above the place where the water passes off. The 14 feet column of water is conducted down to the lower level by a water bag made of leather, and at times this bag accidentally drags out of the mouth of the level, and the water pours upon the men at the bottom of the shaft. A great improvement was effected in the running lift by suspending the column of pump-pipes by large screws attached to wood rods pressed together with clamps, the screws being run out as the pumps are required to be lowered. This lift can be used only when the pumping beam is at least 14 feet above the delivery place. Sometimes the running lifts are used without the screws, but this causes more danger to the sinkers at the bottom of the shaft.

The inconveniences incidental to these arrangements are obviated by this invention, which consists in applying a slide or telescopic pipe at the top of the column of pump-pipes, or anywhere above the clack. It may, for instance, be taken down towards the working barrel, if thought desirable. In this case it will be requisite to have the inside diameter of the slide equal to that of the common pipes of the pump, to allow the bucket to pass through. According to this plan, the pipes can always be put on in the day-time; whereas in the old slide and running lifts the pipes must be put on as soon as the sinking has been lowered 9 feet, or the length of a pipe.

THE WAGES OF ARTIZANS IN THE ROYAL DOCKYARDS.*

The following remarks upon this subject, by Mr. Andrew Murray, the chief engineer of Portsmouth Dockyard, are very important, because if a superior officer of a dockyard is likely to state the case with a bias in favour of either the artizans or the government, the artizans would certainly not be the favoured parties. Mr. Murray is quite right when he says that, in naming 1*s*. per day as the average sum by which the wages of shipwrights in the Royal yards fall below those of shipwrights in private yards, he "understates rather than overstates their case." An average of 2*s*. per day would be a much more correct estimate. In all other respects Mr. Murray's remarks deserve all confidence:

"From the tenor of those parts of the debate of the 14th instant on the Civil Service Superannuation Bill which referred to the artizans of the dockyards it is evident," says Mr. Murray, "that a misconception prevails as to their not being subject to a diminution of their pay on account of their being entitled to the advantage of a pension. Having been for many years connected with the employment of men in engine-making and shipbuilding, before I entered the service of the Admiralty, my testimony as to the comparative remuneration of such workmen in government and in private service will, perhaps, be accepted.

"The working shipwrights and other workmen on the establishment of the dockyards receive pensions, the highest rate being £24 per annum; they also receive half-pay under the name of 'hurt money,' during such time as they may be unable to work on account of any injury they may receive in the execution of their duty; while those under private masters possess neither of those advantages. In consideration of these two advantages, and in order that the government may meet the expenditure entailed by them, the artizans are paid at a low rate of wages; the shipwrights are paid (and I understate rather overstate their case) 1*s*. per day less than shipwrights in private yards, taking the average rate of wages throughout the whole country; and this loss, or diminution, or deduction, by whatever name it may be called, amounts to £15 12*s*. per annum.

"By our accounts it is shown that a few shillings per annum from each man would cover the 'hurt money,' no sick money being paid by the Government; and from the tables of good insurance offices it will be found that a man of about the age of twenty-five years can obtain £100, payable to himself at the age of sixty, or to his representatives if he dies before that age, for the sum of £2 12*s*. per annum, or 6*d*. per day off his wages. Reckoning the value of money at eight per cent., at the age of sixty to purchase an annuity, £300 cash to him at that age will be more than equal to the Government pension of £20 or £24. He could therefore obtain for an annual payment of £7 10*s*., instead of £15 12*s*., as kept back from him by the

* Since the publication of our former article upon this subject, the Admiralty have raised the pay of the shipwrights for such of their work as cannot be measured, and which was before paid for at the rate of 4s. only per day.

Government, not only this sum for himself in his old age, but, in the event of his early death, it would be payable to his widow or children, or any representative. This class of pensioners, therefore, pay for their own pensions, if these statements be correct; and I should not venture to ask a place for them in your columns if I had not paid much attention to the subject, on account of the large number of workmen under my charge, whom it has been my desire to induce to provide for themselves in their old age upon these principles, the men of the steam factories being engaged at the market rate of wages, and not entitled to any pensions.

"It is true that in the event of being disabled in the service before sixty, the Government artizan has the further advantage of a pension; but these cases are so few that they would not affect the money question; and in private manufactories, if a man lose a leg or an arm, a situation as porter, or something of that kind, is generally found for him. Constant and steady employment tends to induce good men to remain in Government employment; but for this they have to pay the other *6d.* per day.

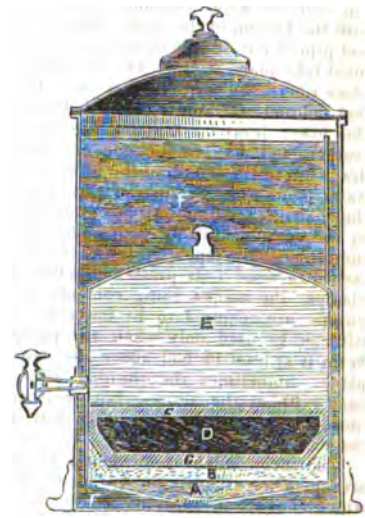
"As to the argument that the number of applications for situations is a proof that civil servants are sufficiently well paid, the plain answer is that the higher the pay the better men will you get and keep; and if any office is not sufficiently well paid, you will only get inferior and inefficient men, and plenty of these are always to be had for any place at any salary."

RANSOME'S PATENT FILTERS.

Messrs. Ransome and Co., of Ipswich and Westminster, have recently brought forward a variety of improved filters, in which two most important purifying processes—filtration by ascension, and the use of reduced charcoal—are introduced.

Of the advantages of filtration by ascension it is unnecessary to say more than that, by it the heavier impurities contained in water or other fluid, which are carried downward by the action of gravitation, instead of being deposited in and clogging up the filtering medium, are allowed to fall to the bottom of a chamber from which they may be readily removed, and consequently, filters constructed upon this principle will keep in order much longer than the ordinary ones, and cost less for renewal.

The great efficacy of charcoal as a purifier was never so well understood as at present, and it is gratifying to observe that the application of it as a filtering medium has not been delayed. The accompanying engraving represents one of many useful methods in which it is employed, in conjunction with the ascending motion of the fluid, by Messrs. Ransome and Co., in the construction of filters. A is a layer of coarse grit; B, one of fine sand; C, a slab of a species of porous stone (patented by the same firm, and used



very extensively, either alone or in combination with other filtering substances); D, a bed of animal charcoal; E, the filtered water, and F, the unfiltered water. This construction of filter is very light and portable, and free from liability to fracture.

We have not space for detailing the various forms of filters manufactured by the inventors; nor does it fall within our present object to do so, as we desire simply to direct attention to a class of important articles to which great improvements have been applied.

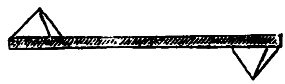
TYERMAN'S PATENT HOOP-IRON BOND FOR BUILDINGS.

Mr. Tyerman, architect, of Weymouth-street, London, recently patented a very simple, but at the same time a very important improvement in the bond iron used for building purposes. His invention consists "in subjecting hoop-iron or strips of other metal to certain mechanical processes, which will produce on the edges or surfaces, or on either or both of them, a rough or jagged, or notched, or perforated, or undulating, or rasp-like, or spikey effect, or

other such like method or methods, whereby an additional key, tie, or hold may be made upon or with the matters or substances brought in connection therewith, or which may become imbedded thereon." There are several modes of effecting this object, but that which is preferred is to use the ordinary hoop-iron, and to have the edges cut or notched to the extent of one-sixth part or thereabouts of the width of the hoop-iron, at intervals of about 12 inches, on alternate sides; the cuts or notches not being opposite each other, and one or both of the parts cut being turned in succession at an angle of about 45°, with the surfaces. Fig. 1 is a plan, and fig. 2 an enlarged section of the bond, showing the position and form of the claws. These claws, or projections, on the iron bond, after becoming imbedded in the materials of a building, prevent the sliding or working of the surrounding parts, and thus contribute greatly to the strength and stability of the structure.

Fig. 1.

Fig. 2.



PRICES OF MEAT AND BREAD.

We gather from a report of the French Minister of Agriculture, Commerce, and Public Works, the following statistics as to the price of bread and meat, in some of the principal towns of England, Scotland, and the Continent. The list is made up for the last fortnight of January. Meat per kilogramme (equal to rather more than 2 lbs. 3 oz.)

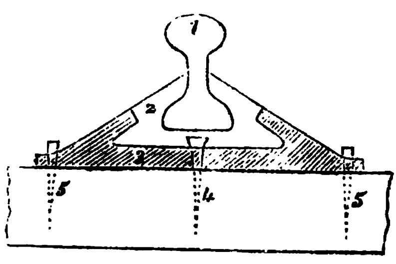
	Bread.	Beef.		Veal.		Mutton.	
	C.	F.	C.	F.	C.	F.	C.
Paris	55	1	42	1	90	1	53
London	62	1	91	2	01	1	83
Glasgow	60	1	60	1	84	1	72
Newcastle	60	1	78	1	78	1	66
Edinburgh	63	1	56	1	82	1	70
Antwerp	63	1	46	1	54	1	75
Rotterdam	76	1	69	2	11	1	48
Amsterdam	76	1	69	2	12	1	48
Elsinore	66	1	28	1	32	1	44
Oporto	64	1	02	1	52	1	29
Seville	61	1	30	1	30	1	02
Cadiz	60	1	65	1	70	1	38
Barcelona	75	1	40	1	82	1	82
Nice	60	1	80	1	50	1	55
Leghorn	59	1	26	1	68	1	40
Rome	61	0	92	1	20	1	00
Trieste	70	1	30	1	52	1	00
Malta	50	1	94	2	81	1	81
Constantinople	87	1	09	1	09	1	00
Philadelphia	60	1	91	1	24	0	96

IMPROVED RAILWAY CHAIR.

To the Editor of the Mechanics' Magazine.

Sir,—I enclose a plan for a chair of permanent way. It consists of two cast-iron chairs, one fitting into the other, the outside one being permanently secured to the sleepers, the one intended for the inside being then placed in the fixed, or outside one; a bolt being placed at the end through which the inside one enters, to prevent its egress, a raised ledge being at the opposite end of the outside chair for the same purpose. I have two objects in view in this plan. First, to prevent the necessity of removing the sleepers when new rails are required; and secondly, to render the rails more secure than they are by the system of using wooden wedges at present in practice. 1 is the rail; 2 2, the inside chair; 3 3, the outside or fixed chair; 4, a bolt to secure the inside chair; 5 5, bolts to secure the outside chair to the sleepers.

Whether the plan I propose would effect those two things I cannot say. I only sug-



gest this plan, it being one I have thought

of for some time. I hope it will come under the notice of "Engineer," as I have no doubt he will give his opinion on the plan I propose. Should you have room in your columns, the insertion of the above will much oblige.

I am, Sir, yours, &c.,
JOHN H. ALLEY.

Belfast, February 15, 1856.

TURNING RIMS ON CIRCULAR PLATES.

To the Editor of the Mechanics' Magazine.

SIR,—In my business, which is rather extensive, I use small machines for turning up a rim on circular tin plates; but for large vessels this rim should be half an inch deep, which the machines I have will not turn up. I have seen a tin water meter, which has a rim half an inch deep on an 18-inch diameter, and which is evidently turned up by a machine. If any of your readers can inform me where I can procure such a mashine, and the price, I shall esteem it a favour.

I am, Sir, yours, &c.,
JOSEPH ABBOTT.

Mount-street, Nottingham,
Feb. 16, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

HAMILTON, F. *Improvements in adjusting the top cards or flats of certain carding engines.* Patent dated July 14, 1855. (No. 1585.)

This invention is applicable chiefly to "Evan Leigh's Patent Carding Engines." The claim is the use of a block, and a regulating set screw, or any equivalent agents, for adjusting the distance between the top cards or flats and the main cylinders of such engines.

SADLEIR, T. *An improvement in apparatus for heating liquids.* Patent dated July 14, 1855. (No. 1586.)

This invention consists in inserting a hollow vertical chamber, open at top and bottom, in or about the centre of any vessel suitable for heating liquids, and in placing therein a basket or case containing charcoal or other similar heating medium which will create little or no smoke. Apertures are provided in the bottom of the basket or case for the admission of air.

BURKE, F. *Improvements in obtaining or preparing the fibres of the plantain, banana, aloe, and other vegetables, for various manufacturing purposes.* Patent dated July 14, 1855. (No. 1587.)

This invention consists in submitting the vegetable substances to the action of beaters or projections fixed upon the periphery of a revolving drum, roller, or cylinder, so that the fibres may be separated from the other vegetable matters with which they may be combined or mixed. The platform or apron upon which the vegetable matters are placed is covered with leather or other soft material.

ATKINSON, E. S. *Apparatus for condensing or absorbing muriatic acid gas from the furnaces or kilns used in the manufacture of sulphate of soda.* Patent dated July 14, 1855. (No. 1588.)

This invention consists in the use and adaptation to such furnaces or kilns of certain apparatus placed between the furnace or kiln and the chimney shaft, for the purpose of conducting the vapours into a condenser containing water, the object being to collect the muriatic gas instead of allowing it to escape as heretofore.

TAYLER, W. H. *Improvements in hermetically sealing preserve canisters and other vessels by means of a new arranged screw cap and fittings.* (A communication.) Patent dated July 16, 1855. (No. 1590.)

Claim.—The method of hermetically sealing or closing preserve canisters and other vessels by the use of a screw cap or cover provided with a gasket or washer of vulcanized caoutchouc or other elastic material, the lower edge of the said screw cap or cover entering an annular trough containing a cement, which, after being fused and allowed to cool, hermetically seals the screw cap or cover upon the canister or vessel.

REGAZZOLI, A. *Impelling railway carriages up ascents.* (A communication.) Patent dated July 16, 1855. (No. 1591.)

For enabling a locomotive with its train to ascend steep gradients on a line of railway, a cylinder, having on its circumference two helices which form a double threaded screw, is placed under and parallel to the axis of the boiler, and when put in motion by steam from the engine, gears with a series of circular posts or horizontal pulleys placed between the line of rails, which pulleys or posts act as a female threaded screw.

GAVIOLI, L. *A new or improved musical instrument called clavi-accord.* (A communication.) Patent dated July 16, 1855. (No 1592.)

These improvements relate to musical wind-instruments with bellows, and consist, first, of a novel contrivance by which the bellows are actuated by a part of the hand or hands, whilst the same are playing on the key-board; also of a novel arrangement of the keys; and, lastly, of the general construction of the instrument by which it is rendered very portable, and a great extent of notes is obtained within a very small volume.

PASCAL, J. B. *Certain improvements in obtaining motive power.* (A communica-

tion.) Patent dated July 16, 1855. (No. 1593.)

This invention consists:—1. In a system of generating apparatus hermetically closed, in which combustion is effected by means of air blown either from beneath or from above the fuel, whatever may be the nature of the latter, and whatever may be the pressure existing in the generators. 2. In producing inside the apparatus a mixture heated at a high temperature, and consisting of air, steam, and the gaseous products of combustion, &c. 3. In constructing vaporising surfaces with metal substances, connected to each other so as they may dilate independently of one another, and thereby break the incrustations or sediments caused by the evaporating of water, &c.

TUCK, T. H. *Improvements in blowing-apparatus, and other apparatus and engines in which air and other elastic fluids are used.* (A communication.) Patent dated July 16, 1855. (No. 1594.)

This invention consists in forming apertures in the pipes or conduits through which air and other elastic fluids are intended to pass, in such a manner as to admit an additional supply of air or other elastic fluid through such apertures into the said pipes or conduits during the passage of the air or other elastic fluids through them, and thereby increase the effect of the latter for whatever purpose they may be employed.

NEWMAN, J. and W. WHITTLE. *Improvements in the manufacture of axles.* Patent dated July 16, 1855. (No. 1595.)

These improvements consist—1. In manufacturing hollow axles with solid journals, and with one or more diametrical bars or radial supports running longitudinally through the interior to strengthen their tubular form, whilst extreme lightness is obtained. 2. In constructing solid axles upon the same principle, such axles having the longitudinal bar before named running through their entire length.

NEWTON, W. E. *Improved mechanism for operating the shuttles of looms.* (A communication.) Patent dated July 16, 1855. (No. 1597.)

This improvement consists simply in using a picker staff to drive the shuttle, hung in the usual way, but so that its action on the shuttle shall cease when it has reached a perpendicular position.

LAROCHE, P. *Improvements in rotatory steam engines.* Patent dated July 17, 1855. (No. 1598.)

Claim.—"A system of moveable wings as applied to rotatory steam engines, whether such wings be put in motion by a fixed or moveable eccentric, or by any other piece or portion of machinery whatsoever."

SALAVILLE, S. *An improved apparatus for airing and preserving grain, seeds, apples, potatoes, hops, and other similar articles in granaries, warehouses, and ships.* Patent dated July 17, 1855. (No. 1601.)

This invention consists of an arrangement of perforated pipes, which are laid below the materials to be preserved, and through which currents of air are forced by fans or otherwise.

[Nos. 1603, 1604, and 1608, which should appear here, will be given first in next week's Number.]

REILLY, J. *Improvements in bending or shaping iron hoops for casks.* Patent dated July 18, 1855. (No. 1612.)

This invention consists in rolling hoop iron in a cold state, so as to stretch it along one edge, to give it the form required for fitting round the curve of the cask when it is formed into hoops.

TOYE, C. *Improvements in looms for weaving pile and terry fabrics.* Patent dated July 18, 1855. (No. 1613.)

This invention consists in applying to such looms two frames, one of which carries an adjusting bar, and has placed in it a series of wires or dents with blanks or stops between them, while the other has placed in it a carrier heddle. These frames are placed between the reed and the ordinary heddles, to regulate the distance between the foundations of double woven fabrics, and thus to regulate the length of the piles or terries of such fabrics. Also in adding to such a loom a terry wire or wires, and apparatus for working the same, by which two looped or terry fabrics may be simultaneously produced.

SMITH, W. *Improvements in the manufacture of steel-wire for musical instruments, sewing-needles, and other purposes.* Patent dated July 18, 1855. (No. 1614.)

The object of this invention is to shorten the time during which the wire is retained at a high temperature, and subjected to the injurious action of the gases generated in the furnace in conducting the annealing process. The wire is passed in a string through the furnace, and in direct contact with the heat evolved therefrom, allowing it only to remain there sufficiently long to obtain the heat desired; and for this purpose the furnace is provided with a hole or holes sufficiently large to admit of the passage of the wire into and from it.

TRAPP, T. *An improvement in connecting and disconnecting screw propeller and other shafts.* (A communication.) Patent dated July 18, 1855. (No. 1615.)

This invention consists in fitting to the ends of two shafts, which it may be required to connect and disconnect, discs, or collars, or rings, and keys or wedges, and in causing the connection or disconnection of the shafts by tightening or loosening the keys or wedges at any portion of the revolution of either shaft.

Ellis, J. *Certain improvements in the process of manufacturing ammonia, charcoal, and animal and vegetable naphtha.* Patent dated July 18, 1855. (No. 1616.)

This invention consists in the use of apparatus of the following construction:—First, an apparatus composed of three retorts set in brickwork, a separate pipe leading from each to a condenser kept immersed in cold water. A pipe extends from the condenser to a vat, and is furnished with a valve for the escape of overcharged gas as it passes from the condenser into the vat. The condensed products are afterwards removed to the second apparatus, where they are distilled, the result being crude naphtha and ammonia, which are passed from the end of a worm into a portable receiver so constructed as to separate the naphtha from the ammonia. The naphtha is then placed in a large vat, and well mixed with sulphuric acid and lime (about 1 part acid to 24 of lime), and is then pumped into a third apparatus, in connection with which is a steam pipe, the use of the steam being to rectify, wash, and force the naphtha into an adjoining compartment, where the process of washing, &c., is again repeated as before. By employing several such compartments, it may be still further purified. It then passes through the worm, and the product is pure naphtha. The impure ammonia is placed in an ordinary still set in brickwork, and the process of repeated distillation is conducted.

Bell, W. *Improvements in the manufacture of warp fabrics.* Patent dated July 18, 1855. (No. 1618.)

This invention consists in producing ornamented fabrics, when three or more full sets of threads are employed to the needles, by applying additional threads of different colours to those of the ground or body of the fabrics.

Bellford, A. E. L. *A new or improved method of condensing vapours and smoke.* (A communication.) Patent dated July 18, 1855. (No. 1620.)

Claims.—1. Condensing certain parts of muriatic, sulphuric, or nitric acid, which are often lost in the manufacturing of sulphate of soda and sulphuric acid, by making use of the said acids for manufacturing baryta and barytic salts. 2. Condensing ammoniacal vapours in manufactures of animal black, and washing coal smokes for producing ammoniacal salts and smoke blacks or manure. 3. Extending the condensing system to the hot air that escapes from furnaces in which are treated lead, ashes, cobalt, &c.

Bellford, A. E. L. *Improvements in the valves and passages for effecting the induction and eduction of steam in steam engines.* Patent dated July 18, 1855. (No. 1621.)

This invention mainly consists in the employment of a cylindrical valve or valves with bevelled edges, or the equivalents thereof, working between seats which surround the induction and eduction ports.

Scully, V., and B. J. Heywood. *Improvements in the construction of cocks and taps.* Patent dated July 18, 1855. (No. 1622.)

Claims.—1. The application to cocks and taps of a swivel pin provided with a helical rib or feather or other projections for preventing access (except by a suitable key) to the screw bolt, stop, or plug, by which the discharge of liquids or fluids is arrested or prevented. 2. The use of an inner plug with a discharge passage through it for the purpose of regulating or cutting off (as may be required) the flow of liquids or fluids through cocks and taps, such plug being suitably protected. 3. Making the handle hollow for the reception of the key by which the locking and unlocking of the tap is effected.

Scully, V., and B. J. Heywood. *Improvements in the construction of locks and latches, and in keys for same.* Patent dated July 18, 1855. (No. 1623.)

In the place of an ordinary key hole, the inventors form a cylindrical chamber through which the key is inserted, and in this chamber they place and secure a swivel pin which is provided with a helical rib or feather or other lateral projection which will offer an obstacle to the insertion of a key other than that of a given construction.

Martin, R., and J. C. Martin. *An improvement in obtaining pulp from wood.* Patent dated July 19, 1855. (No. 1624.)

The inventors obtain the fibrous strings or threads of wood, by first saturating with water planks or other pieces of wood, and then subjecting their surfaces to a toothed cylinder or other instrument having teeth, resembling a saw or rasp.

Clarke, J. P. *An improvement in the manufacture of metallic reels.* Patent dated July 19, 1855. (No. 1625.)

This invention consists in the application of an end or ends or discs of metal, with holes or openings through them to a hollow metallic cylinder, to facilitate the winding of fibrous material.

Wright, S. B., and H. T. Green. *Improvements in the manufacture of bricks and tiles.* Patent dated July 19, 1855. (No. 1626.)

This invention consists—1. In a method of screening clay to separate from it roots or stones, &c., by passing it through a pug mill with a perforated barrel through which it is expressed, the clay and roots being discharged at the bottom. 2. In a method of applying water to lubricate the dies of brick and tile machines. 3. In finishing

the mouldings on bricks formed with mouldings, by bringing them when in a dry but unburnt state into contact with a revolving block with a corresponding moulding on its periphery.

LAWRIE, J. G. *Improvements in steam-engines.* Patent dated July 19, 1855. (No. 1627.)

It is not possible to give here a complete abstract of this specification; it may, however, be said that by one arrangement described, when the engines are not very large, the two steam cylinders, the air pump, and the condenser may be with advantage made in one casting. By the peculiar combination constituting this part of the invention, framing is dispensed with, and the combined engine rendered very compact. Another part of the invention relates to working steam expansively, and consists in applying link motions to, or combining link motions with, expansion valves employed to regulate the supply of steam to the valves or valve boxes.

BERTINETTI, P. *A new safety projectile.* Patent dated July 19, 1855. (No. 1628.)

This invention consists in forming a communication between a ship in distress and the shore, or between any other two places, by means of a cord attached to a projectile thrown from a cannon. The cord employed, when coiled round, forms part of the projectile, which is of such a construction as will enable it to resist the force of the explosion of the gunpowder used when firing it off.

FISKEN, D., and T. R. H. FISKEN. *Improvements in transmitting steam or other power for the tillage of land by ploughs and other implements, as well as for other purposes, and machinery for applying the power so transmitted.* Patent dated July 19, 1855. (No. 1629.)

A description of this invention is given on page 179 of this number.

FERRYMAN, E. A. *An improved churn.* Patent dated July 19, 1855. (No. 1630.)

A description of this invention will shortly be given.

WOOLBERT, J. H. *Improvements in the preparation of extracts from madder and in the application of the same directly to fabrics in order to dye or colour them.* (Partly a communication.) Patent dated July 19, 1855. (No. 1632.)

Claim.—A peculiar treatment of madder, and the combination of the colouring matters obtained therefrom with thickening substances, and the application of the same direct to fabrics in the form of a pulp or paste.

JOHNSON, J. H. *Improvements in transmitting motive power, principally applicable to horse-mills.* (A communication.) Patent dated July 19, 1855. (No. 1633.)

These improvements consist in the entire suppression of bevil gearing, and the substitution of spur gearing.

JOHNSON, J. H. *Improvements in apparatus for actuating railway breaks.* (A communication.) Patent dated July 19, 1855. (No. 1634.)

These improvements consist in the employment of a moveable weight placed in communication with the actuating rod of any ordinary break, and so arranged that when the break is out of action the weight is held up or supported, but when the weight is released it instantly falls and by its gravity supplies the power requisite for putting on the break.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GAUDIN, P. I. A. *Improvements in baths used for photographic purposes.* Application dated July 13, 1855. (No. 1581.)

These improvements relate to baths of nitrate of silver or collodion, into which paper or glass is immersed previous to receiving the phothographic impression, and consist in maintaining, and in certain means of maintaining, the bath at a proper temperature for the purpose. To effect this the bath is surrounded with a double casing of metal, or other suitable material, into which is placed a cooling or warming mixture as may be required.

NEALE, C. L. *A new medicinal lotion, to be called "The Crimean Neuralgic Specific."* Application dated July 13, 1855. (No. 1582.)

This lotion consists of three liquid ingredients (of the ordinary commercial strength) one pint of rose-water, distilled, one tablespoonful of the best distilled white vinegar, and six drops of laudanum.

DERRIEJ, J. J. *Improvements in machines for manufacturing lozenges, wafers, or pastilles of pasty materials.* Application dated July 14, 1855. (No. 1584.)

This invention relates to a mechanical arrangement for manufacturing lozenges, wafers, &c., and consists of a series of rollers between which the paste passes for bringing the same to the required thickness, after which the paste is carried forward between a revolving cylinder and a moveable sliding piece, the latter being provided at its underside with suitable protruding dies, placed opposite to punching plates fixed flush on the outside of the cylinder.

KEALY, J. F. *Improved machinery for the pulping of turnips and other vegetable substances.* Application dated July 14, 1855. (No. 1589.)

In a suitably-shaped hopper is mounted a cylinder, which is covered with sheet iron

or steel, furnished with projecting teeth or pointed-cutting edges. As the cylinder is rotated, these teeth reduce the turnips, or other roots subjected to their action, to a pulp which falls into a receptacle below.

NEWTON, W. E. *Improvements in vices.* (A communication.) Application dated July 16, 1855. (No. 1596.)

The first part of this invention relates to a peculiar method of maintaining the jaws in a parallel position, while the moving parts of the vice are being operated, and consists in connecting the jaws together by means of jointed and parallel links. The links are jointed on a pivot at the middle and at their ends, and are provided with buttons or studs, which work in vertical grooves made in the body of the jaws, as the latter are moved further from or nearer to each other.

JENNER, W. *An improved beverage.* Application dated July 17, 1855. (No. 1602.)

This invention consists in forming a beverage from roasted ground rice and a small quantity of chicory.

SCRAGG, E. *Improvements in steam engines.* Application dated July 17, 1855 (No. 1605.)

This invention mainly consists in the employment of a valve composed of a conical plug, rotating steam tight in a conical chamber, and communicating with the steam pipe at one end, and with the exhaust or waste pipe at the other.

HUTHNANCE, H. *An improved method of effecting the combustion of coals as used in the production of heat.* Application dated July 17, 1855. (No. 1606.)

These improvements consist in submitting the coals to a coking or distilling process in one or more retorts or coking apparatuses placed above the fire-grates of the furnaces or fire-places, so that the coke may fall from the retorts or coking apparatuses on to the fire-grates below, or into a receptacle contiguous thereto.

BARRY, E. *An improvement in pianofortes, organs, seraphines, harmoniums, and other musical instruments played with a keyboard similar to that of a pianoforte.* Application dated July 17, 1855. (No. 1607.)

This invention consists in introducing into the above-named instruments supplementary notes and certain mechanical contrivances by means of which the performer may transpose his music from one key to another, either above or below concert pitch.

RIOT, T. L. M., and S. G. P. DEHAIS. *Improvements in the treatment of silk.* Application dated July 18, 1855. (No. 1609.)

This invention consists in submitting wild silk to the action of solutions of alkali (particularly potash, soda, or ammonia), in water.

HOYOS, F. *Improvements in roasting-spits.* Application dated July 18, 1855. (No. 1610.)

These improvements consist in having a roasting-spit furnished with spindles to which the articles to be roasted are attached, and which are made to turn lengthways before the fire, their motion being so combined with other motions produced by gearing, that the articles are made to rotate more rapidly when they are near to than when they are remote from the fire.

ALMGILL, T. *An improved mode of printing on calico and other fabrics and matters, and in machinery and apparatus to be employed therein.* Application dated July 18, 1855. (No. 1611.)

This invention consists in having the pattern or device (in surface printing) cut or etched through thin copper, tin, wood, or other substance, and put on a wire fabric, which fabric and pattern will be fastened on a hollow perforated cast iron cylinder, &c.

POLLARD, J. *Improvements in the manufacture of gas.* Application dated July 18, 1855. (No. 1617.)

In this invention each retort is made with a return-bend proceeding from the back to the front end, such return-bend being above the retort. The front end is made with an incline, from front to back, and the front end of both the retort and the return-bend is covered with a lid.

KING, J., and J. HOLDSWORTH. *Improvements in the manufacture of certain woven cotton fabrics.* Application dated July 18, 1855. (No. 1619.)

This invention relates to coloured fabrics, especially fustians, and consists in applying warp or weft spun from cotton, wholly or partly dyed the colour required in the fabric, prior to being spun.

THOMPSON, J., and J. MILLS. *Improvements in power looms.* Application dated July 19, 1855. (No. 1631.)

The object of these improvements is to relieve the shuttle at the time of "picking" from the pressure of the "swell" which is acted upon by the stop-rod lever. It consists in forming a finger on, or in attaching a finger to, one of the rods connecting the slay with the cranks, which finger is made long enough to reach under one of the stop-rod fingers, and (in consequence of the angular motion of the connecting rod) lift that finger while the slay moves from the fell of the cloth, and thus relieve the swell and the shuttle.

BROADBENT, T. *Improved apparatus for filtering liquids.* Application dated July 19, 1855. (No. 1636.)

In this invention the cistern which receives the supply of water is divided by a vertical partition into two compartments,

and in the lower part of this partition is formed a water-way, which is filled with sponge or other suitable porous substance. In front of this water-way, on the supply side, is a filter box filled witha granular substance, and covered with a double perforated lid having a layer of sponge between its parts. On the other side of the water-way in the partition is a second filter box.

Gilbee, W. A. *The employment of a new material in the manufacture of paper.* (A communication.) Application dated July 20, 1855. (No. 1639.)

Dog's grass is the "new material" (!) here mentioned.

PROVISIONAL PROTECTIONS.

Dated October 19, 1855.

2348. William Armand Gilbee, of Rue de l'Echiquier, Paris, France. Improvements in the application of silicate of potash to hardening and preserving stones and calcareous materials. A communication.

Dated December 10, 1855.

2785. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in obtaining motive power by means of heated compressed air. A communication.

Dated December 31, 1855.

2952. Sir John Scott Lillie, Companion of the Order of the Bath, of Pall Mall, Middlesex. Improvements in guns, fire-arms, and implements of war connected therewith.

Dated January 17, 1856.

152. William Westbrooke Squires, of Liverpool, Lancaster, Doctor in Medicine. Improvements in preventing the bursting of pipes and tubes for conveying liquids.

Dated January 23, 1856.

178. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in the treatment and application of fatty, resinous, and gummy substances, and in the manufacture of pastes, greases, and soaps. A communication.

Dated January 25, 1856.

207. Alexis Jean Dessales, of Rue des Enfants Rouges, Paris, France. Improvements in oil-lamps and in reflectors for the same for railway carriages and other purposes.

Dated January 26, 1856.

209. Alexander Dalgety, of Florence-road, Deptford, Kent, engineer. An improved self-acting stand or tilt for casks or barrels.

211. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in compressed air locomotive engines. A communication from J. P. L. F. Datichy, of Paris, France, mechanician.

213. Patrick Doran, of Cornwallis-street, Liverpool, Lancaster. Improvements in pneumatic apparatus for raising sunken vessels or other bodies under water, and for keeping afloat vessels or other bodies liable to sink.

215. William Spurrier, of Birmingham, Warwick, manufacturer. A new or improved method of attaching handles to metallic tea-pots and other vessels, which method of attachment may also be applied to the fixing of castors on furniture and other like purposes.

217. Wilhelm Dreschfeld, of Manchester, Lancaster, clerk. An improvement in, or addition to, rollers employed in spinning.

219. Alexander James Walker, of New York, and William Bennett, of Brooklyn, New York, United States. An improved method of forming hat-bodies, or other felted articles.

Dated January 28, 1856.

220. Abram Longbottom, of Moorgate-street, and William Longmaid, of Victoria Cottage, Stoke Newington. Improvements in apparatus for generating and heating steam.

221. Peter Brown, of Liverpool, Lancaster, corn-merchant, and George Brown, of the same place, corn merchant. Improvements in the method of cleaning, dressing, and preparing a certain description of seed or grain, called "dari," and frequently called "millet," and thereby rendering the same suitable for food.

225. Jean Baptiste Jules Hyppolite d'Auvergne, of Blois, France, gentleman. Improvements in portable writing or drawing-desks.

227. Pierre Emmanuel Guérinot, of Rue au Maire, Paris, mechanician jeweller. Stopping instantaneously two railway trains running against each other.

229. Samuel Jabez Goode, of Aston, near Birmingham, Warwick, machinist. A new or improved gas-stove.

231. Jean Hector Destibeaux, manufacturer, of Paris, French empire. An improved waterproof fabric.

233. Henry Samuel King, of the firm of Smith, Elder, and Co., of Cornhill, London, stationers. Improved apparatus for printing and embossing. A communication.

Dated January 29, 1856.

235. William John Simons, of Royston, Herts, gentleman. An improved governor for steam and other engines requiring governors.

237. William Henry Lancaster and James Smith, of Liverpool, Lancaster. Improved arrangements for the application of gas and atmospheric air to the generation of heat in furnace or other flues, and the consumption of smoke.

239. James Fleming, engine-keeper, of Glasgow, and George Fyfe, millwright, of Glasgow, Lanark. The consumption of smoke in engine and other fires.

241. William Fowler and William McCollin, of Kingston-upon-Hull. An improved thrashing-machine.

243. Samuel Palmer Gladstone, of Lea Cottage, Orchard-house, Poplar. Improvements in the construction of masts and yards.

245. Abraham Pope, of Edgware-road, Middlesex. Improvements in the manufacture of iron, copper, tin and lead.

Dated January 30, 1856.

247. Robert Walter Winfield, of Birmingham, Warwick, merchant and manufacturer. An improvement or improvements in the manufacture of metallic bedsteads and other articles of metallic furniture.

248. John Henry Walsh, of Portland-place, Clapham-road, Surrey. Improvements in omnibuses.

249. John Toward, of the Glasshouse-bridge Ironworks, Newcastle-upon-Tyne, engineer. Improvements in iron ship-building, and in iron plates therefor, which plates are also applicable to other purposes where great strength is required.

250. Charles Frederick Claus, of Latchford, Chester, chemist. Improvements in the preparation of hides or skins, also applicable to the preparation of the entrails of animals.

251. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improvement in the manufacture of cannon. A communication.

252. William Gossage, of Widnes, Lancaster, chemist. Improvements in the manufacture of certain kinds of soap.

253. Thomas Fewster Wilkinson, of Bloomsbury-street, Bedford-square, London, agricultural engineer. Improvements in reaping and mowing-machines.

254. John Lee Stevens, of London, civil engineer. Improvements in doors or apparatus for regulating the supply of air to steam boiler and other flues and furnaces.

255. John Gretton, of Burton upon-Trent, Stafford, brewer. Improvements in brewing.

Dated January 31, 1856.

256. John Stokes, of Birmingham, Warwick, lamp-maker. An improvement or improvements in fog-signals.

257. Henry Holford, of Newton Iron-works, Hyde, Chester, engineer, and Mark Mason, of the same place, machine-maker. Improvements in machinery or apparatus for compressing metals and for manufacturing all kinds of metallic rivets, bolts, or similar articles.

258. Aubin-Emile-Coullard Descos, of Paris, France. Improvements in consuming smoke.

259. James Mash, of Manchester, Lancashire, engineer. Improvements in working the valves of steam engines.

260. George Napier, of Bath-street, Glasgow, Lanark, and Adelphi, Middlesex, engineer. Improvements in apparatus for raising, lowering, and suspending boats from ships.

261. Henry Tylor, of the firm of Tylor and Pace, of New Bond-street, Middlesex, manufacturers. An improved joint, applicable to cots, bedsteads, and other frames in metal.

262. John Kinniburgh, of Renfrew, North Britain, foundry manager. Improvements in moulding or shaping metals.

263. Joseph Harrison and John Oddie, of Blackburn, Lancaster, machinists. Improvements in machines for winding yarn or thread on to spools or bobbins.

264. Thomas Burdett Turton and John Root, of the Sheaf and Spring Works, Sheffield, York. Improvements in buffer bearing and draw springs.

265. Henry Render, of Manchester, Lancaster, merchant. A new or improved lubricating material.

266. Frederick Kersey, of Laurie-terrace, St. George's-road, Southwark. An improvement in the manufacture of drain-pipes.

267. George Hallen Cottam and Henry Richard Cottam, of Old St. Pancras-road. Improvements in folding bedsteads and chairs.

268. John Barker Anderson, of East Hill, Wandsworth, Surrey, soap-manufacturer. Improvements in the manufacture of soap, parts of which improvements are applicable to preparing materials for the purposes of illumination, and also for the purposes of lubrication.

269. Thomas Hurst, of Tanner-street, Barking, Essex, railway-contractor. Improvements in the connecting of the rails or metals generally used on railways.

270. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in gas-burners, and in regulating the combustion of gas. A communication from P. A. Maunoury, of Paris, France, mechanician.

Dated February 1, 1856.

272. Matthew Ker, of Cumberland Market, St. Pancras, Middlesex. A machine for sweeping carpeted and other floors.

274. Francis Preston, of Manchester, machinist. Improvements in machinery for shaping and rolling metal.

276. Charles Robert Moate, of Old Broad-street, London, metal-broker. An improvement in securing and sustaining the rails of railways.

278. William Dray, of the firm of Deane, Dray, and Deane, of King William-street, London, manufacturers. An improved cartridge-box and pouch.

280. Francis Best Fawcett, of Kidderminster, Worcester, carpet-manufacturer. Improvements in the manufacture of carpets.

282. George Norgate Hooper and William Hooper, of the Haymarket, Middlesex, carriage-builders. Improvements in springs for carriages, and for the cushions of carriages, chairs, mattresses, beds, and other similar articles.

284. George Duckett, of Norfolk-terrace, Westbourne-grove West, Bayswater. Improvements in carts and vans.

286. Charles Catherine Joubert, of Rue de Moscow, and Leon André Bordier, of Rue de la Ferme des Mathurins, Paris, France. Improvements in motive-power engines.

288. John O'Meara Beamish, of Trafalgar-road, Old Kent-road, gentleman. An improvement in the manufacture of morocco leather.

Dated February 2, 1856.

290. John Rock Day, of Birmingham, Warwick, machinist. A new or improved door-lock and latch.

292. Benjamin Burleigh, of the Great Northern Railway, King's-cross. Improvements in certain parts of the permanent way of railways.

294. William Goodman, of Canning-place, Leicester. Improvements in machinery for producing knit or looped fabrics.

Dated February 4, 1856.

298. Ralph Waller, of Manchester, manufacturer. Improvements in preparing cotton and other fibrous materials.

302. Matthew Whiting, junior, of Manning-street, Bermondsey, tanner. Improvements in preparing for and in tanning hides and skins.

304. Nathan Ager, of Upper Ebury-street, Pimlico, Middlesex, carpenter. Improvements in connecting spindles of locks and latches with their knobs and handles.

306. Thomas Mills, of Leicester, manufacturer of gloves and fancy hosiery. Improvements in machinery for the manufacture of looped fabrics.

Dated February 5, 1856.

308. Frans-Victor-Oscar Hyckert, of Paris, France. Improvements in heating.

310. Michael Leopold Parnell, patent-lock manufacturer, of Strand, Middlesex. An improvement in the construction of locks.

312. Francis Montgomery Jennings, of Cork, manufacturing chemist. Improvements in bleaching vegetable fibres.

316. Thomas Williams, of Clerkenwell, Middlesex, mechanist. Improvements in omnibuses.

Dated February 6, 1856.

318. George Napier, of Bath-street, Glasgow, Lanark, and Adelphi, Middlesex, and John Miller, of Cavendish-street, Glasgow, Lanark. Improvements in the mode of driving and in applying screw propellers to the propulsion of vessels.

320. John Dodgeon, of Burnley, Lancaster, machinist, and James Wilson Bateson, of Rawtenstall, Lancaster, mechanic. Certain improvements in looms for weaving.

322. John Inshaw, of Birmingham, Warwick, engineer. A new or improved pressure-gauge.

324. Charles Victor de Sauty, of St. Mary's-terrace, Walworth, Surrey, electrician. The prevention of the leading or fouling of fire-arms.

326. Franklin Prestage, of Wylye, Heytesbury, Wilts. Improvements in locomotive engines.

328. Charles Frederick Philipp Funcke, of Herdecke, Westphalia, tanner and currier. Improvements in tanning skins and hides.

Dated February 7, 1856.

330. Richard Bleasdale, of Rochdale, Lancaster, mechanic. Certain improvements in the machines for spinning called throstles.

334. Henry Berlette, of Boulogne-sur-mer, France. An improved apparatus for roasting coffee.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

345. John Wallace Duncan, of Grove-end-road, St. John's-wood, Middlesex, gentleman. Improvements in or connected with apparatus for the generation and application of steam for impelling purposes. February 9th, 1856.

PATENT CANCELLED.

The patent granted to William Calder, of Glasgow, Lanark, manager, for "Improvements in the treatment and finishing of threads or yarns," dated 25th November, 1853 (No. 2744), has been cancelled by order of the Lord Chancellor, dated 25th July, 1855.

NOTICE OF APPLICATION FOR PROLONGATION OF PATENTS.

A petition will be presented to the Committee of the Privy Council by John Thomas Betts, William Betts, James Betts, and David Betts, of Smithfield Bars and Wharf-road, distillers, &c., praying for a prolongation of the several letters patent granted to John Thomas Betts, late of Smithfield Bars, gentleman, deceased, for England 11th August, 1842, for Scotland 12th January, 1843, and for Ireland 24th December, 1842, for "Improvements in covering and stopping the necks of bottles and other vessels." Any person intending to oppose the above application, must enter a caveat to that effect at the Privy Council Office on or before the 24th March next.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," February 19th, 1856.)

2228. Richard Henry Hill. A jointed back band for gig or brougham harness, affording instant relief to fallen horses, and always inclining to the draught of the traces.

2242. John Hubbard. An improved sole for boots and shoes.

2250. Joseph Gilbert Martien. Improvements in the manufacture of iron and steel.

2258. Stephan Goldner. Improvements in apparatus used in cooking and preserving animal and vegetable matter.

2263. Richard William Pyne and William Malam. An improvement in the manufacture of gas.

2268. Denis Hébert. Improvements in heating and arranging ovens. A communication.

2273. William Andrew Fairbairn and George Haslam. Improvements applicable to locomotive engines and carriages.

2274. William Bayley and John Quarmby. Improvements in machines for carding cotton and other fibrous materials.

2275. Peter Spence. Improvements in the production of sulphate of alumina to be used in the fluid state, or to be rendered into the solid condition known commercially as cake alum.

2276. William Bridges Adams. Improvements in machinery and tools for cutting and carving wood and other materials.

2290. Germain Adolphe Thibierge. Certain improvements in manufacturing chlorine, part of which are applicable for obtaining certain accessory products.

2313. William Edward Newton. Improvements in the construction of fire-arms. A communication.

2332. Thomas Richards Harding. Improvements in combs, gills, and hackles used in the preparing and manufacturing of flax, silk, wool, or other fibrous substances, and in combs for combing the human or other hair.

2334. John Wakefield. Improvements in machinery used in the manufacture of screw-blanks, nails, pins, rivets, and other similar articles.

2341. John Smith. Improvements in the construction of bedsteads, such improvements being applicable to carriages, ambulances, and other articles.

2343. William Armand Gilbee. Improvements in the application of silicate of potash to hardening and preserving stones and calcareous materials. A communication.

2351. Pierre Arnaud Massip. A machine for preparing hat linings. A communication.

2356. Hypolyte Gaudibert. An improved construction of guard for preventing surreptitious removal of watches, purses, pocket-books, and other articles from the person.

2368. George Collier, William Bailey, and Richard Horsfall. Improvements in drying wool and other fibrous substances.

2392. Thomas Beatt Sharp and Richard Furnival. Certain improvements in machinery for drilling, grooving, and slotting.

2422. Jules Jean Baptiste Sylvain Martin de Lignae. An improved mode of preserving animal substances.

2440. John Pinches. An improved machine or apparatus for embossing paper, metal and other substances by hand.

2448. John Cottrill. Improvements in machinery or apparatus for washing, scouring, dyeing, sizing, and cleaning woven fabrics and yarns.

2511. Charles Allen Browne. A machine for manufacturing bricks. A communication.

2571. Alfred Vincent Newton. An improved manufacture of electrotype printing surfaces. A communication.

2584. William Cooke. An improved apparatus for cleaning knives and other cutlery.

2831. Evan Evans. Improvements in combining and fixing railway bars.

2883. Philip Antrobus. Improvements in preserving and packing flour.

2937. Paul Marie Salomon. Improvements in the manufacture of gas from peat, and in the coke resulting therefrom, and also in the apparatus connected with that manufacture.

2. Ferdinand Swift. Improvements in carriage-wheels and axles, and in vehicles for common roads.

37. Joseph Wright. Improvements in furnaces and fire-bars.

67. Frederick Albert Gatty. Improvements in the manufacture of lake colours.

108. Joseph Hostage, Thomas Ives Brayne Hostage, and John Tatlock. Improvements in railway chairs.

159. James Pockson. Improvements in the construction of roofing and other tiles.

162. Pierre Lewis Tieffé-Lacroix. Improvements in machinery for cutting files.

169. Edward Lawson and George Jennings. Improvements in reeling machines, for winding flax, cotton, wool, and other yarns.

171. Joseph Francis. Improvements in the manufacture of metallic boats.

194. David Fisher. Improvements in machinery for pressing, cutting, drying, and opening tobacco.

198. Andrew Shanks and Francis Herbert Wenham. Certain improvements in water gauges.

249. John Toward. Improvements in iron ship-building, and in iron plates therefor, which plates are also applicable to other purposes where great strength is required.

251. Alfred Vincent Newton. An improvement in the manufacture of cannon. A communication.

252. William Gossage. Improvements in the manufacture of certain kinds of soap.

272. Matthew Ker. A machine for sweeping carpeted and other floors.

292. Benjamin Burleigh. Improvements in certain parts of the permanent way of railways.

294. William Goodman. Improvements in machinery for producing knit or looped fabrics.

304. Nathan Ager. Improvements in connecting spindles of locks and latches with their knobs and handles.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

381. Peter Armand Lecomte de Fontainemoreau.
390. Benjamin Greening.
396. William Blissett Whitton and George Samuel Whitton.
407. John George Perry.
413. James Murphy.
418. Thomas Clark Ogden and William Gibson.
421. Charles Watt and Hugh Burgess.
437. Wright Jones.
476. John Grist.
557. Thomas Wells Cross.
666. William King Westly.
1195. Moses Poole.

LIST OF SEALED PATENTS.

Sealed February 12, 1856.

2664. James Clark.
2667. William Edward Newton.
2669. Hiram Hyde.
2706. Samuel Cunliffe Lister.
2802. Alexandre Forot.

Sealed February 15, 1856.

1861. Charles Rowley.
1873. Edward Heys.
1875. Robert Crawford.
1897. Dupont de Bussac.
1909. Joseph Gilbert Martien.
1949. Richard Archibald Brooman.
1986. Edward Greene Jones.
2018. Charles Pryse and Paul Cashmore.
2044. Jean Panet.
2141. Etienne Laporte.
2357. Henry Woodrow.
2493. Samuel Cunliffe Lister.
2508. Charles Marie Pouillet.
2512. Henry John Betjemann.
2581. George Tomlinson Bousfield.
2671. Charles Rice.
2673. Charles Rice.
2812. Thomas Rickett.
2864. Hiram Hyde.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Jan. 24	3805	F. Smith	Birmingham	Tap.
29	3806	T. Poole and A. M'Gillivray	Prince's-street, Cavendish-square	Rotatory Map-stand.
Feb. 1	3807	Smith, Kemp, and Wright	Birmingham	Belt-clasp.
2	3808	Price's Patent Candle Company	Vauxhall	Carriage-lamp.
7	3809	T. and C. Clark	Wolverhampton	Sash-frame pulley.
15	3810	P. and F. Schafer	Brewer-street, Golden-square	Travelling bottle and glass.
18	3811	F. Allies	Worcester	Winch-reel, with check.
		PROVISIONAL REGISTRATIONS.		
Jan. 26	738	F. Cornwall	Birmingham	Grate.
28	739	R. Newton	Birmingham	Envelope.
31	740	J. Wilson	Welbeck-street	Shirt-front.
Feb. 2	741	Butterworth and Co.	Southwark	Boot-fastening.
5	742	W. H. Bowers	East-road, City-road	Railway-buffer.
7	743	W. D. Gray	Old Kent-road	Spring-stopper.
,,	744	G. Neall	Northampton	Gas-stove.
,,	745	T. H. Roberts	Plymouth	Apparatus for cleaning casks.
14	746	J. F. Sharpin	Scarborough	Blind-guard.
16	747	A. Ross	Newington	Shawl.
16	748	E. Wood	Islington	Ever-pointed pencil.
19	749	W. B. Flint	Birmingham	Shutter-fastener.
20	750	A. Moseley	Fulham	Tobacco-pipe.
21	751	E. Collier	Gray's-inn-road	Arm-sling.

NOTICES TO CORRESPONDENTS.

C. again writes to us on the subject of the mode in which the steam acting in a locomotive produces motion in the engine, and says that our "notion of the common theory is, like other peoples', based on the assumption that there is a '*moving force*' in the adhesion of the rim of the driving wheel to the rail. I shall make some remarks with the intention of demonstrating that that assumption is purely a figment of the brain." In another place he says, "I apprehend that there is not any need of a force external to the engine: an external fulcrum certainly is necessary, and that the adhesion affords." C. shows us that the driving-wheel of an ordinary locomotive may be regarded as a lever having the point of contact of the rail as a fulcrum, and that by this view we see immediately that there is a resultant pressure to propel the engine (when the crank is below the axle and cylinder in front, say) equal to the difference between the pressure of the steam on the end of the cylinder and the retarding force communicated to the axle by the pressure on the piston acting, as it does, at the disadvantage due to the lever of the third order.

This is exactly the result given by the ordinary and more correct method of treating the subject. Such a solution of the problem, or, rather, such a mode of stating the solution of the problem, as C. gives, we should regard as very promising in a very young beginner in the study of mechanics, but by no means as the production of a person who has any right to assume towards us the tone of a teacher to a not very intelligent pupil. We are so well satisfied with, and have so much confidence in the ordinary theory, that nothing short of total annihilation of all the elements of mechanics can in any way remove our trust. Let us remind our correspondent that he cannot know what the ordinary theory is, or he would not think there was anything new in treating this as a question of the lever. Let us also remind him that there are always three forces acting on a lever, and that one of these always acts at the fulcrum.

To say that no external force is necessary to the production of motion in the machine is, *prima facie*, untrue. No body was ever set in motion by internal forces only; it is simply impossible that it could be.

What meaning does C. suppose can be attached to the statement that an external fulcrum is necessary? Is it not the same as to say that an external force is necessary? What is a fulcrum? Is it not some fixed obstacle—some *point d'appui* on which any required force may be exerted without moving it? Indeed C., in using the ordinary rule for determining the forces acting on a lever, uses the very principle against which he is running a tilt. If he discards this way of treating a lever, he must certainly not assume the truth of a proposition which is deduced from it. This force of friction, or adhesion, as C. calls it, is to us no matter of supposition or assumption at all. Its existence is simply and unmistakeably a fact.

The Inventor of Gardner's Smoke-consuming Furnace—Your letter came too late for insertion in this number.

CONTENTS OF THIS NUMBER.

Ullmer's Patent Paper-Cutting Machine (*with engravings*) 169
London Fires in 1855. By Mr. W. Baddeley, C.E. (*concluded*) 170
On the Harmony of Theory and Practice in Mechanics. By Professor W. J. M. Rankine 175
A New Sphygmoscope, or Instrument for Indicating the Movements of the Heart 177
Fisken's Patent Agricultural Apparatus 179
Hewitt's Patent Improvements in Pumps 179
The Wages of Artizans in the Royal Dockyards 180
Ransome's Patent Filters 181
Tyerman's Patent Hoop-iron Bond for Buildings 181
Prices of Meat and Bread 182
Improved Railway Chair 182
Turning Rims on Circular Plates 183

Specifications of Patents recently Filed:

Hamilton .... Carding-engines 183
Sadleir .... Heating Liquids 183
Burke .... Preparing Fibres 183
Atkinson .... Sulphate of Soda 183
Tayler .... Canister-fittings 183
Regazzoli .... Propelling Carriages 183
Gavioli .... Clavi-accord 183
Pascal .... Motive Power 184
Tuck .... Blowing-engines 184
Newman & Whittle .... Axles 184
Newton .... Driving Shuttles 184
Laroche .... Rotary Engines 184
Salaville .... Preserving Grain 184
Reilly .... Hoops for Casks 184
Toye .... Looms 184
Smith .... Steel Wire 184
Trapp .... Connecting Shafts 184
Ellis .... Ammonia, Charcoal, &c. 185
Bell .... Warp Fabrics 185
Bellford .... Condensing Vapours, &c. 185
Bellford .... Valves 185
Scully & Heywood. Cocks and Taps 185
Scully & Heywood. Locks, &c. 185
Martin & Martin ... Wood Pulp 185
Clarke .... Metallic Reels 185
Wright & Green ... Bricks and Tiles 185
Lawrie .... Steam Engines 186
Bertinetti .... Projectiles 186
Fisken & Fisken ... Ploughs, &c. 186
Ferryman .... Churns 186
Woolbert .... Dyeing Fabrics 186
Johnson .... Horse-mills 186
Johnson .... Railway-breaks 186

Provisional Specifications not Proceeded with:

Gaudin .... Photography 186
Neale .... Medical Lotion 186
Derriej .... Lozenge Machines 186
Kealy .... Pulping Vegetables ... 186
Newton .... Vices 187
Jenner .... Beverage 187
Scragg .... Steam Engines 187
Huthnance .... Burning Coals 187
Barry .... Pianofortes, &c. 187
Riot and Dehais ... Silk 187
Hoyos .... Roasting-spits 187
Almgill .... Printing on Fabrics ... 187
Pollard .... Gas 187
King and Holdsworth .... Woven Fabrics 187
Thompson & Mills Power Looms 187
Broadbent .... Filtering Liquids 187
Gilbee .... Paper 188

Provisional Protections 188
Patent Applied for with Complete Specification 190
Patent Cancelled 190
Notice of Application for Prolongation of Patents 190
Notices of Intention to Proceed 190
Patents on which the Third Year's Stamp-Duty has been Paid 191
List of Sealed Patents 191
List of Designs for Articles of Utility Registered 191
Notices to Correspondents 192

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1699.] SATURDAY, MARCH 1, 1856. [Price 3d

Edited by R. A. Brooman, 166, Fleet-street.

CHATTAWAY'S PATENT RAILWAY BUFFING AND COUPLING APPARATUS.

Fig. 1.

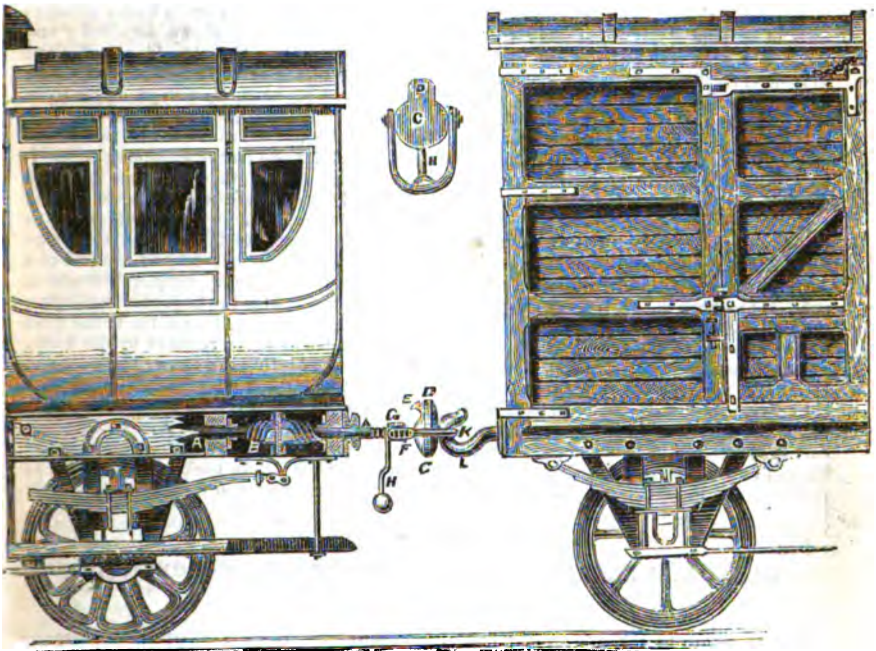
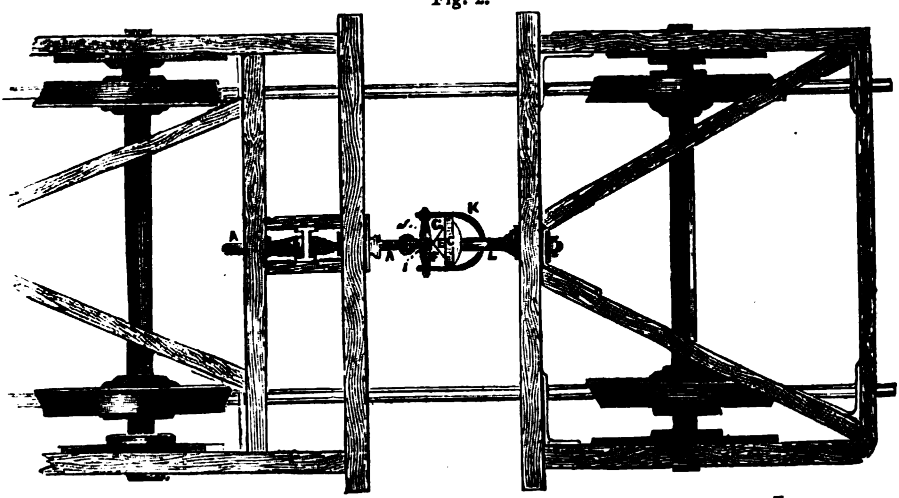


Fig. 2.



CHATTAWAY'S PATENT RAILWAY BUFFING AND COUPLING APPARATUS.

On page 162 of this volume (No. 1697), among the abstracts of the specifications of patents recently filed, was given a brief description of an improved arrangement of buffing and coupling apparatus for railway carriages, the invention of Mr. E. D. Chattaway, of Edinburgh. We now give, on the preceding page, illustrations of that invention.

Fig. 1 is a side elevation of the two contiguous ends of a first-class carriage and a goods wagon as joined together in a train by the improved combined buffing and coupling apparatus, all the parts being shown in external elevation except a part of the carriage framing, which is broken away to exhibit the duplex spring upon the main buffer spindle; an end or face elevation of the buffer head and coupling link is shown detached; and fig. 2 is a plan of the carriage and wagon framing and coupling details. The buffer and draw-rod, A, is represented as connected to the framing of the carriage by a duplex volute spring, B. On this rod is fixed the irregularly shaped buffer head, C, with its upper right line projection, D, this projection being hook-formed on its inner face, as at E. The rod, A, is screwed at F, where it has fitted upon it an adjusting nut, G, with a loaded pendulous setting lever, H. This nut, G, is formed externally as a collar seat for the traversing collar, I, carrying two opposite projecting arms, J. The opposite ends of these arms are arranged to answer as the bearing journals for the two longitudinally slotted ends of the wide connecting link, K, the curved end of which embraces the plain hook, L, on the buffer-beam or framing of the wagon, on the right-hand side of the engravings. In this manner a carriage fitted with the improved combined buffing and drawing arrangement may be coupled to a carriage having a simple central draw-hook arranged in the ordinary manner hitherto in use. When both the carriages of a contiguous pair are fitted with the improved apparatus, the link, K, of one carriage draw-rod is passed over the projection, D, on the buffer head of the other carriage, such link being screwed up tight, so as to be retained by the hook-point, E, on the back of the projection, D. Instead of adopting the screwed spindle and collar arrangement for tightening up the coupling, the rod, A, may be left plain, the collar, G, being loose upon it, and carrying a pin connected to it by a chain, such pin being for insertion in transverse vertical holes bored through the rod, A. In coupling carriages where this contrivance is used, the link, K, being passed over the draw-hook or hooked buffer head of the adjacent carriage, the collar, G, is drawn back by hand as far as possible, and the retaining pin is then inserted in the nearest hole in front of the collar in the rod, A.

FARADAY'S EXPERIMENTAL RESEARCHES IN ELECTRICITY.

(*Continued from page* 157.)

But to return to the subject of "induction." The question started by Faraday, as to the nature of the "magne-crystallic" force, viz., "whether it is an original force inherent in the crystal of bismuth, &c., or whether it is induced under the magnetic and electric influences?" is one which may be understood in a *useful* and also in a *useless* sense; it may have a meaning assigned to it which leads to profitable inquiry, and it also may be so treated as to lead only to barren metaphysical disputation. What then, we ask, is the meaning of "an original force?" What is the exact and precise idea attached to these words? In what sense can one *force* be properly called "an original force" more than another?

Take the case of the magnet SN., and the piece of soft iron (*sn.*) Two different suppositions may be made, as Faraday says, with regard to the condition of this iron before it is brought into proximity with the magnet. (1.) The iron may be supposed to consist of particles, each of which possesses in itself the two poles of a magnet, so that each particle, if it existed alone, would act as a magnet when brought near to another magnet; but in consequence of the irregular arrangement of these particles in the iron, the total *external* effect or force is nothing; one set of particles counteracting the other. On bringing the magnet SN., however, into proximity with the iron (*sn.*), the *first* and *immediate* effect is to bring all these confused and jumbled particles into order and regularity, whereby all the poles of these minute magnetic particles are made to act in concert, and thus the whole mass becomes converted into one large magnet. In this case the magnetic power or force may be said to be *original* in the iron, and the act of "induction" to consist merely in the arranging and harmonising of those elementary magnetic poles which had heretofore destroyed each other's effect by their mutual opposition and discordance.

(2.) Secondly, it may be supposed that

there are no such elementary *magnetic* particles in the iron, before the presence of the magnet; but that the mere presence of the magnet, SN. *creates*, as it were, this magnetic polarity; which again is the proximate cause of the final attraction of the whole mass. In *this* case, the magnetic force or property may be said *not* to be "original" in the iron.

But it will be obvious that if we accept the first of the above cases, we are no nearer than we were before to the comprehension of the real nature of magnetic force. We have only divided one large magnet into a countless number of small magnets; but how these small magnets come to *be magnets* remains as great a mystery as ever.

In the second case we have simply the bare fact that the proximity of a magnet makes soft iron a magnet of like nature and properties. Now although the first of these suppositions leaves us quite as ignorant of the chief mystery as ever, it may be very useful as a guide to us in the investigation of those *secondary* circumstances which accompany the phenomenon. We shall have occasion to return to this discussion when we come to the consideration of Faraday's general theoretical views; at present we return to the purely experimental inquiry whether the magnecrystallic force is "an original force" (in the sense above named) "inherent in the crystal of bismuth, &c., or whether it is induced under the magnetic and electric influences." This force, as Faraday says, clearly cannot consist in the mere "arrangement of the *particles* of the crystal," "for all the particles are arranged beforehand; and it is that very arrangement of them [*and their forces*] which gives the bismuth its power." We have placed the words "and their forces" in italics and brackets, because we cannot implicitly accept them as our own, and do not, in fact, perceive the exact meaning to be attached to them. Arrangement of "particles" is by no means synonymous with "arrangement of forces;" nor does there appear to be any safe ground for reasoning on the *latter* point. One can easily understand what is meant by "the arrangement of *particles*," but not so easily perceive what is the signification of "arrangement of their forces."

The interesting fact mentioned in paragraph (2578) does not seem to us to throw any light on the question which it is brought forward to illustrate. The forces of crystallisation might, for anything we can see to the contrary, be just as *uniform* in any one portion of the mass as in another.

"(2579.) The following are considerations which bear upon this great question of an original or an induced state.

"(2580.) In the first place, the bismuth carries off no power or particular state from the magnetic field able to make it affect a magnet; so that if the condition acquired by the crystal be an induced condition, it is probably a transient one, and continues only whilst under induction. The fact, therefore, though negative in its evidence, agrees as far as it tells with that supposition.

"(2581.) In the next place, if the effect were wholly due, as far as the crystal is concerned, to an original power inherent in the mass, we might expect to find the earth's magnetism, or any weak magnet, affecting the crystal. It is true that a weak magnetic force ought to *induce* any given condition in a crystal of bismuth just as well as a stronger, only proportionally; but if the given condition were inherent in the crystal, and did not change in its amount by the degree of magnetic force to which it was subjected, then a weak magnetic force ought to act more decidedly on the bismuth than it would do if the condition were induced in the bismuth, and only in proportion to its own force. Whatever the value of the argument, I was induced to repeat the experiment of the earth's influence very carefully; and by sheltering the suspended crystals in small flasks or jars contained within the larger covering jar, and making the experiment in an underground place of uniform and constant temperature, I was able to exclude every effect of currents of air, so that the crystals obeyed the slightest degree of torsion given to the suspending fibre by the index above. Under these circumstances I could obtain no indications of pointing by the earth's action, either with crystals of bismuth or of sulphate of iron. Perhaps at the equator, where the lines of force are horizontal, they might be rendered sensible.

"(2582.) In the third place, assuming that there is an original force in these crystals and their molecules, it might be expected that they would show some direct influence upon each other, independent of the magnetic force; and if so, the best possible argument would be thus obtained that the force which is rendered manifest in the magnetic field was inherent in them. But on placing a large crystal with its magnecrystallic axis horizontal under a smaller and suspended one, or side by side with it, I could procure no signs of mutual action, even when the approximated parts of the crystals were ground or dissolved away, so as to let the two masses come as near as possible to each other, having large surfaces at the smallest possible distance. Extreme care is required in such experi-

ments, or else many results are produced which seem to show a mutual affection of the bodies.

"(2583.) Neither could I find any trace of mutual action between crystals of bismuth, or of sulphate of iron, when they were both in *the magnetic field*, the one being freely suspended and the other brought into various positions near to it.

"(2584.) From the absence, therefore, or extreme weakness of any power in the crystals to affect each other, and also from the action of heat, which can take away the power of the crystal before it has lost its mere crystalline condition, I am induced to believe that the force manifested in the crystal when in the magnetic field, which appears by external actions, and causes the motion of the mass, is chiefly and almost entirely *induced*, in a manner, subject indeed to the crystalline force, and finally additive to it, but at the same time exalting the force and the effects to a degree which they could not have approached without the induction.

"(2585.) In that case the word magneto-crystallic ought probably to be applied to this force, as it is generated or developed under the influence of the magnet. The word magnecrystallic I used purposely to indicate that which I believed belonged to the crystal itself; and I shall still speak of the magnecrystallic axis, &c., in that sense.

"(2586.) This force appears to me to be very strange and striking in its character. It is not polar, for there is no attraction or repulsion. Then what is the nature of the mechanical force which turns the crystal round, or makes it affect a magnet? It is not like a turning helix of wire acted on by the lines of magnetic force; for there there is a current of electricity required, and the ring has polarity all the time, and is powerfully attracted or repelled.

"(2587.) If we suppose for a moment that the axial position is that in which the crystal is unaffected, and that it is in the oblique position that the magne-crystallic axial direction is affected and rendered polar, giving two tensions, pulling the crystal round, then there ought to be attractions at these times, and an obliquely-presented crystal ought to be attracted by a single pole, or the nearest of two poles; but no action of this kind appears. * *

"(2589.) I do not remember heretofore such a case of force as the present one, where a body is brought into position only, without attraction or repulsion."

Faraday must surely have forgotten, whilst writing these last lines, the simple fact that terrestrial magnetism is exactly "such a case of force;" for the compass needle is not attracted or repelled *as a whole*, though it is "brought into position." The "magnecrystallic force" brings the crystal into a certain position, but does not attract or repel the *mass* of the crystal as a whole. Exactly in the same way the force of the earth's magnetism brings the compass-needle into the magnetic meridian, but does not attract or repel the needle *as a whole*. The simple explanation of this last-named fact, being, that the force is what is called in mechanics a "couple," or two equal and parallel forces applied at different points of a body, and in opposite directions (*i. e.*, *equal* and *parallel* to such a degree of approximation as may be practically considered *rigorously* equal and parallel). The well-known effect of such a force is to turn the body round a certain axis passing through its centre of gravity, without giving any motion of translation to the body *as a whole*. Just the same is it in the common experiment of the action of a magnet on iron filings; producing those "magnetic curves," which Faraday is so constantly referring to as the "lines of force." If the magnet be not too near the filings it will not produce any attraction or repulsion in them, although it brings them all into certain *positions*, viz., the magnetic curves. Each of the particles is converted (by "induction") into an indefinitely small magnet, having two poles; one of which is attracted, and the other repelled by the opposite poles of the inducing magnet. But as the lines joining the two poles of the small magnetic particle with any point in the great magnet, may be practically considered as equal and parallel, within certain limits the attraction for the one pole is equal and opposite to the repulsion of the other; and so there is no other result than merely to turn the particle round its centre of gravity. For precisely similar reasons, the magnetic force of the earth produces similar effects on the common compass-needle. However freely and delicately suspended, with the most perfect freedom of motion in all directions, no such needle has ever yet been found to move *bodily* or *as a whole* under the action of terrestrial magnetism. The "*directive*" force may therefore be very great, whilst at the same time the *attractive* or *repulsive* effects are imperceptible; one, in fact, counteracting the other. In an experiment made at the suggestion of a "philosopher of eminence" by Professor Barlow, he took a vessel of water and filed a piece of soft iron with a new file, so that the dust of the iron was distributed on the surface of the water; he then brought the north pole of his experimental magnetised sphere nearly in contact with the surface of the water, and the motion of the filings was to indicate the existence of the pole in question. "I per-

formed this experiment," says Barlow, "in two or three different ways, but I could never distinguish the least motion of the filings." (Essay on Magnetic Attractions, 2nd edition, page 181). We presume he means "no motion in the filings *as a mass or whole*."

We do not pretend to say that the "magnecrystallic force" is of exactly the same nature, but there is nothing in the mere facts described by Faraday which, in our opinion, takes it so completely out of comparison with other forces as he appears to think. The force may diminish much more rapidly with the distance than ordinary magnetism; and, indeed, must do so, or rather it must be much less powerful at the same distance, in order that the same explanation may apply to the effects which we have just alluded to. The mechanical resultant of all the forces emanating from the magnet on the crystalline particles must be of the nature of a "*couple*"—giving *position* only, without translation of the whole mass; and *so far* analogous to ordinary magnetism *at a sufficient distance;* but whether this "couple" is brought about in the same way, of course we cannot presume to say.

We proceed with Faraday's remarks:

"(2591.) I cannot resist throwing forth another view of these phenomena, which may possibly be the true one. The lines of magnetic force may, perhaps, be assumed as in some degree of resembling the rays of light, heat, &c., and may find difficulty in passing through bodies, and so be affected by them as light is affected. They may, for instance, when a crystalline body is interposed, pass more freely or with less disturbance through it in the direction of the magnecrystallic axis than in other directions. In that case the position which the crystal takes in the magnetic field, with its magnecrystallic axis parallel to the lines of magnetic force, may be the position of no, or of least resistance; and therefore the position of rest and stable equilibrium. All the diametral effects would agree with this view. Then, just as the optic axis is to a ray of polarized light, namely, the direction in which it is not affected, so would the magnecrystallic axis be to the lines of magnetic force. If such were the case, then, also, as the phenomena are developed in crystalline bodies, we might hope for the discovery of a series of effects dependent upon retardation and influence in direction, parallel to the beautiful phenomena presented by light with similar bodies. In making this supposition, I do not forget the points of inertia and momentum; but such an idea as I can form of inertia does not exclude the above view as altogether irrational. I remember, too, that when a magnetic pole and a wire carrying an electric current are fastened together, so that one cannot turn without the other, if the one be made axis, the other will revolve round and carry the first with it; and also that if a magnet be floated in mercury, and a current sent down it, the magnet will revolve by the powers which are *within* its mass. With my imperfect mathematical knowledge, there seems as much difficulty in these motions as in the one I am supposing, and therefore I venture to put forth the idea. The hope of a polarized bundle of magnetic forces is enough of itself to make one work earnestly with such an object, though only in imagination, before us; and I may well say that no man, if he take industry, impartiality, and caution with him in his investigations of science, ever works experimentally in vain."—(Page 122, 123.)

We look upon this passage as one of the most interesting, and, at the same time, the most curious in the whole of Faraday's work. The character of the man might be gathered from these few sentences alone. The purest love of science, the most zealous ardour and perseverance in its pursuit, combined with a modesty as genuine as it is rare, might be safely predicted of the writer of the above sentences. It might also be truly inferred from them that, as he himself so candidly confesses, he has, unfortunately, not received the benefit of a training in those mathematical studies which are of such inestimable value to the physical investigator. Deeply is it to be regretted, both for his own sake and that of science itself, that such should be the fact; for we feel thoroughly convinced that, valuable as the labours of Faraday have been, they would have been ten thousand times *more* valuable had they been guided and directed by the light of mathematical reasoning. Throughout the whole of these beautiful "Experimental Researches," we perceive the want of those clear and distinct ideas as to the nature and operation of *force*, which can only be acquired by a course of rigorous mathematical study of mechanics. In the very passage just quoted there is ample evidence of this. But we must postpone any further remarks on this head to the close of our review.

Soon after the publication of Faraday's first researches on Diamagnetism and the Action of Magnetism on Polarized Light, Plücker, professor of Natural Philosophy in the University of Bonn, took up the investigation, and arrived at what he considered an entirely *new* class of phenomena. The nature of these will appear clearly from the following statement, which we extract from the translation of Plücker's paper in Poggendorff's Annalen, Oct. 1847, ("Taylor's

Scientific Memoirs," part xix. vol. 5, p. 353).

"The object of the present memoir is to make known a series of new observations, which form a sequel to the last discoveries of Faraday, from which the idea of making them originated. The results of these observations, when arranged in the form of a general expression, lead to the following empirical laws:

"*When any crystal having a single optic axis is placed between the two poles of a magnet, this axis is repelled by each of the two poles. If the crystal has two optic axes, each of these two axes is repelled by each of the two poles with the same force.*

"*The force which produces this repulsion is independent of the magnetic or diamagnetic condition of the mass of the crystal; it diminishes less as the distance from the poles of the magnet increases, than the magnetic or diamagnetic forces emanating from these poles, and acting upon the crystal.*"

[In a second paper, by the same author, in the same volume, there is an interesting inquiry into "the relation of magnetism to diamagnetism," of which, however, we cannot take any notice at present.]

Faraday accepted these new facts and views of Plücker; and speaks of them thus in the paragraph immediately succeeding the one last quoted.

"(2592.) I have already referred, in the former paper (2469) to Plücker's beautiful discovery and results in reference to the repulsion of the optic axis of certain crystals by the magnet, and have distinguished them from my own obtained with bismuth, antimony, and arsenic, which are not cases of either repulsion or attraction; believing, then, with Plücker, that the force there manifested is an optic axis force, exerted in the equatorial direction; and therefore existing in a direction at right angles to that which produces the magnecrystallic phenomena.

"(2593.) But the relations of both to crystalline structure, and therefore to the force which confers that condition, are most evident. Other considerations as to position, set, and turning, also show that the two forces, so to say, have a very different relation to each other to that which exists between them and the magnetic or diamagnetic forces. As, therefore, this strong likeness on the one hand, and distinct separation on the other, is clearly indicated, I will endeavour to compare the two sets of effects, with the view of ascertaining whether the force exerted in producing them is not identical.

"(2594.) I had the advantage of verifying Plücker's results under his own personal tuition in respect of tourmaline, staurolite, red ferro-prussiate of potassa, and Iceland spar. Since then, and in reference to the present inquiry, I have carefully examined calcareous spar, as being that one of the bodies which was at the same time free from magnetic action, and so simple in its crystalline relations as to possess but one optic axis.

"(2595.) When a small rhomboid, about 0·3 of an inch in its greatest dimension, is suspended, with its optic axis horizontal, between the pointed poles of the electro-magnet approximated as closely as they can be to allow free motion, the rhomboid sets in the equatorial direction and the optic axis coincides with the magnetic axis; but if the poles be separated to the distance of half or three-quarters of an inch, the rhomboid turned through 90°, and set with the optic axis in the equatorial direction, and the greatest length axial. In the first case the diamagnetic force overcame the optic axis force; in the second the optic axis force was the stronger of the two.

"(2596.) To remove the diamagnetic effect I used flat poles, and then the little rhomboid always set in, or vibrated about, that position in which its optic axis was equatorial.

"(2597.) I also took three cubes of calcareous spar in which the optic axes were perpendicular to two of the faces, of the respective dimensions of 0·3, 0·5, and 0·8 of an inch in the side, and placed these in succession in the magnetic field, between either flat or pointed poles. In all cases, the optic axis, if horizontal, passed into the equtorial position; or, if vertical, left the cubes indifferent as to direction. It was easy by the method of two positions (2470) to find the line of force, which, being vertical, left the mass unaffected by the magnet; or, being horizontal, went into the equatorial position; and then examining the cube by polarised light, it was found that this line coincided with the optic axis (2598). Even the horse-shoe magnet (2485) is sufficiently strong to produce these effects."

"(2609.) There is a general, and, as it appears to me, important relation between Plücker's magneto-optical results and those I formerly obtained with heavy glass and other bodies. When any of these bodies are subject to strong induction under the influence of the magnetic or electric forces, they acquire a peculiar state, in which they can influence a polarised ray of light. The effect is a rotation of the ray, if it be passed through the substance parallel to the lines of magnetic force, or, in other words, in the axial direction; but if it be passed in the equatorial direction, no effect is produced,

The equatorial plane, therefore, is that plane in which the condition of the molecular forces is the least disturbed as respects their influence on light. So also in Plücker's results, the optic axis, or the optic axes, if there be two, go into that plane under the same magnetic influence, they also being the lines in which there is the least or no action on polarized light.

* * * *

"(2614.) I cannot conclude this series of researches without remarking how rapidly the knowledge of molecular forces grows upon us, and how strikingly every investigation tends to develope more and more their importance, and their extreme attraction as an object of study. A few years ago magnetism was to us an occult power, affecting only a few bodies; now it is found to influence all bodies, and to possess the most intimate relations with electricity, heat, chemical action, light, crystallization, and, through it, with the forces concerned in cohesion; and we may, in the present state of things, well feel urged to continue in our labours, encouraged by the hope of bringing it into a bond of union with gravity itself." (Pages 123—129.)

The more recent experiments of Professors Tyndall, Knoblauch, and others have, however, greatly modified and corrected some of the above-named conclusions of Plücker and Faraday. The later researches of Plücker himself led to the conclusion that the axes of optically *negative* crystals only experienced this repulsion, while the axes of *positive* crystals were attracted, or assumed the axial position. But it was afterwards proved by Knoblauch and Tyndall (especially by the latter) that "the law according to which the axes of positive crystals are attracted, and those of negative crystals repelled, was contradicted by the deportment of numerous crystals, both positive and negative. It was also proved that the force which determined the position of the optic axis in the magnetic field was not independent of the magnetism or diamagnetism of the mass of the crystal, inasmuch as two crystals, of the same form and structure, exhibited altogether different effects when one of them was magnetic and the other diamagnetic. * * * The various complex phenomena exhibited by crystals in the magnetic field were finally referred to the modification of the magnetic and diamagnetic forces by the peculiarities of molecular arrangement." (Tyndall, Bakerian Lecture, Philos. Transactions for 1855. Part I.)

This exceedingly interesting subject is even yet in a very unsettled state, as may easily be expected from the complex and general nature of the phenomena. We hope to return to the discussion of it and its recent progress in some future page.

(*To be continued.*)

PERPETUAL MOTION.

A paper containing certain important inferences from the negation of perpetual motion was recently read at the Royal Institution, by W. R. Grove, Esq., Q.C., F.R.S., &c. In the following remarks we give an abstract of the author's communication:

Scattered among the writings of philosophers will be found allusions to the subject of perpetual motion, and here and there are arguments like the following:—Such a phenomenon cannot take place, or such a theory must be fallacious, because it involves the idea of perpetual motion. Thus Dr. Roget advanced as an argument against the contact theory of electricity, as originally propounded, that if mere contact of dissimilar metals, without any chemical or molecular change, could produce electricity, then as electricity could, in its turn, be made to produce motion, we should thus get perpetual motion.

It may be well to define, as far as such a definition is possible, what is commonly meant by the term perpetual motion. In one sense, all motion, or rather all force, is perpetual. For example, if a clock weight be wound up, it represents the force derived from the muscles of the arm which turns the key; the muscles again derive force indirectly from the chemical action of the food, and so on. As the weight descends, it conveys motion to the wheels and pendulum; the former giving force off in the form of heat from friction, the latter communicating motion to the air in contact with it, thence to the case of the clock, thence to the air of the room—proved in a very simple manner by the ticking heard, which is, in fact, a blow to the organ of hearing. Although ultimately lost to our senses, there is no reason to suppose that the force is ever in fact lost. The weight thus acting, reaches the ground quietly, and produces no effect at the termination of its course.

If, instead of being allowed to communicate its force to the works of the clock, the weight be allowed to descend suddenly, as by cutting the string by which it is suspended, it strikes the floor with a force which shakes the house; and thus conveys, almost instantaneously, the amount of force which would be gradually dissipated, though not ultimately consumed, by the clock in a week or nine days.

This idea, however, of the perpetuity of force, is not what is commonly understood by the term perpetual motion: that expression is used to convey the notion of a motive

machine, the initial force of which is restored by the motion produced by itself—a clock, so to speak, which winds itself up by its own wheels and pendulum, a pump which keeps itself going by the weight of the water which it has raised. Another notion, arising from a confusion between static and dynamic forces, was, that motion might be obtained without transferring force, as by a permanent magnet. All sound philosophers are of opinion that such effects are impossible; the work done by a given force, even assuming there were no such thing as friction, ærial resistance, &c., could never be more than equal to the initial force; the theoretical limit is equilibrium. The weight raised at one end of a lever can never, without the fresh application of extraneous force, raise the opposite weight which has produced its own elevation. A force can only produce motion when the resistance to it is less powerful than itself; if equal, it is equilibrium: thus if motion be produced, the resistance, being less than the initial or producing force, cannot reproduce this; for then the weaker would conquer the stronger force.

The object of this evening's communication was not, however, to adduce proofs that perpetual motion, in the sense above defined, is impossible; but assuming that as a recognised truth, to show certain consequences which had resulted, and others which were likely to result, from the negation of perpetual motion; and how this negation may be made a substantive and valuable aid to scientific investigation.

After Oersted made his discovery of electro-magnetism, philosophers of the highest attainments argued, that as a current of electricity, circulating in a wire round a bar of iron, produced magnetism, and as action and reaction are equal, and in contrary directions, a magnet placed within a spiral of wire should produce in the wire an electrical current. Had it occurred to their minds that, if a permanent magnet could so produce electricity, and thence necessarily motion, they would thus get, in effect, perpetual motion, they would probably have anticipated the discovery of Faraday, and found that all that was required was to move the magnet with reference to the wire, and thus electricity might have been expected to be produced by a magnet without involving the supposed absurdity.

In a very different instance, viz., the expansion of water when freezing, not only heat, or the expansive force given to other bodies by a body cooling, would be given out by water freezing, but also the force due to the converse expansion in the body itself: and upon the argument that force would, in this case, be got out of nothing, Mr. J. Thomson saw that this supposed impossibility would not result if the freezing point of water were lowered by pressure, which was experimentally proved to be the case by his brother.

In the effects of dilatation and contraction by heat and cold, when applied to produce mechanical effects, and consequently in the theory of the steam engine, this subject possesses a greater practical interest. Watt supposed that a given weight of water required the same quantity of what is termed total heat (that is, the sensible added to the latent heat) to keep it in the state of vapour, whatever was the pressure to which it was subjected, and consequently, however its expansive force varied. Clement Desormes was also supposed to have experimentally verified this law. If this were so, vapour raising a piston with a weight attached would produce mechanical power; and yet the same heat existing as at first, there would be no expenditure of the initial force; and if we suppose that the heat in the condenser was the real representative of the original heat, we should get perpetual motion. Southern supposed that the latent heat was constant, and that the heat of vapour under pressure increased as the sensible heat. M. Despretz, in 1832, made some experiments which led him to the conclusion that the increase was not in the same ratio as the sensible heat, but that yet there was an increase; a result confirmed and verified with great accuracy by M. Regnault in some recent and elaborate researches. What seems to have occasioned the error in Watt and Clement Desormes' experiments was, the idea involved in the term latent heat; by which, supposing the phenomenon of the disappearance of sensible heat to be due to the absorption of a material substance, that substance "caloric," was thought to be restored when the vapour was condensed by water, even though the water was not subjected to pressure; but to estimate the total heat of vapour under pressure, the vapour should be condensed while subjected to the same pressure as that under which it is generated, as was done in M. Despretz and M. Regnault's experiments.

Carnot's theory, that the mechanical force is produced by the transfer of heat, and that there is no ultimate cost or expenditure of heat in producing it, was founded in part on similar considerations; it is true that mechanical *motion* may be produced by the transfer of heat from a higher to a lower temperature, without ultimate loss, or, practically speaking, with an infinitely small loss, but not, as he seemed to think, an available mechanical force, except upon an assumption which he did not make, and to

which allusion will presently be made. Thus, let a weight be supposed to rest on a piston confining air of a certain temperature, say 50°, in a vessel non-conducting for heat; part of this temperature will be due to the pressure exerted, since compression produces heat in air, while dilatation produces cold. If the air be now heated, say to 70°, the piston, with the weight attached, will rise, and the temperature in consequence of the expansion of the air will cool somewhat, say to 69° (the heat of friction of the piston may be taken to compensate the power lost by friction). If now a cold body be made to abstract 20°, the piston descending will, by its pressure, restore the 1° lost by expansion; and when the piston has returned to its first position, the original 50° will remain as at first. Suppose this experiment repeated up to the rise of the piston, but when the piston is at its full elevation, and the cold body is applied, let the weight be removed, so as to drop upon a wheel, or to be used for other mechanical purposes, the descending piston will not now reach its original point without more heat being abstracted; from the removal of the weight there will not be the same force to restore the 1°, and the temperature will be 49°, or some fraction short of the original 50°; if this were otherwise, then as the ball in falling may be made to produce heat by friction, we should have more heat than at first, or a creation of heat out of nothing—in other words, perpetual motion.

Where force is abstracted from a thermal machine, we ought to lose heat if we suppose the degrees of heat at a lower temperature to represent the same amount of force as the same number of degrees at a higher temperature. If, for instance, we suppose that a body cooling from 120° to 100°, gives off the same force as a body cooling from 20° to zero. This seems to be tacitly assumed by Carnot, but is probably not correct, the results of high pressure steam, and other facts, indicating a contrary conclusion. If, then, the 20° on the lower scale do not represent an equivalent force to the 20° on the higher, we *may* gain the same heat in degrees in the condenser as was lost from the furnace, and yet get derived power. There is frequently a confusion between the work performed which returns to the machine, and the derived work, or that which does not return, and is used for other purposes. This is puzzling to the reader of treatises on the steam engine and kindred subjects, and has led to much obscurity of thought and expression.

(*To be continued.*)

THE NAVAL STEAM-POWER OF GREAT BRITAIN.

The war which, we trust, is about to be brought to an honourable close, cannot fail to have been very suggestive to the thoughtful English artizan. We believe that the patriotic fire burns more brightly in no bosom than in his; and that other than mercenary feelings have been necessary to give rise to the flood of invention which has so bewildered the Ordnance and Admiralty Boards during the past year. He cannot have seen, without the deepest regret, the want of energy, foresight, and enterprise—qualities he so highly prizes—which England has displayed before the earthworks of Sebastopol. He knew that British soldiers were brave, and never wondered when he heard that not a man shrank from the charge into that fire of death at Balaklava; that they needed no titled leaders to direct the home thrusts which won for them immortal renown at Inkermann; and more—he felt that it was true British stuff, which, hungry and half-clothed, watched unweariedly in the cold and darkness of those terrible winter nights. But there are remembrances which he cannot recall without wonder and shame: let us hope that the bitter lesson they have taught us may not be profitless. What we have done on those distant fields of strife has been, in many respects, unworthy of England, but in others, a great and lasting triumph.

Moreover, who that knows anything of the history of steam, can think, without astonishment, of what has been effected by its agency during the last few months! Mighty armies, carried thousands of miles, with scarce a mishap—the allied forces of France and England, borne in one journey across the Black Sea, without the loss of a man. At the commencement of the year 1843, there were not (including mail and tug-boats) seventy vessels propelled by steam, in the Royal British Navy, and the first of Her Majesty's screw ships was still on the stocks. The war list at the opening of the impending campaign will show nearly 450 steam ships—of which upwards of 280 are propelled by steam; these will possess an aggregate power of nearly 300,000 horses.*

It is said, that the Emperor Nicholas once treated himself to the sight of a charge of 10,000 horse! It would take many a long year to raise such a force as this in England, and clever indeed would be

* Assuming the usual high estimate of horse power 33,000 units, and taking the average ratio between the nominal and effective horse power in the royal steam ships.

the Commissariat which should find supplies for them from English soil. But the gun boats alone which will have been provided with engines, by the two firms of Penn and Maudslay, within about eighteen months, are propelled by the power of at least 33,000 horses. Of the 155 vessels of this kind, which are to be ready by the spring, fifty-four will have been launched from the slips of one private builder. And although it might be difficult to make the green fields of England find food for such troops of living horses, there is no difficulty in supplying the innumerable multitudes of steam horses, which, in all parts of the civilized world, look to her for food. It will be seen what these demands must be, when it is remembered that these 450 vessels alone would require, to keep them going at full speed for twenty-four hours, between eight and nine thousand tons of coals!

If it is true that the inefficiency of our land forces has compelled us to bear tamely the insults of the continental powers, and to lean in our decrepitude on the hand of a rival, it is also true that we have such a just confidence in our naval strength as enables us to keep up, without fear, those commercial relations with distant lands, on which our very existence depends.

But for our blockading squadrons, the great pulse of commerce must have ceased to beat, either by the stoppage of the vital circulation under a blockade, or by the weakness attending extensive losses in the open sea. If the apparent value of our navy has been so great in an offensive war peculiarly unfitted for the development of its power, we may feel confident in the result of a defensive war, with whomsoever waged. It is from her sea-throne that Britannia sways the sceptre of her power; we are secure, because she rules the waves. Let us not be surprised then, or disheartened at the inability of England to find men enough to make a respectable army; the world finds other work for the hands of her sons in the workshop and factory. We are, as all islanders must be, to a certain extent, cosmopolitan; the tide of population rises, bursts all the dams of race and country, and connects the source of its existence with the remotest lands. The purpose of our war establishments should be not to reap glory from fields of blood where the loss of life is so great, and where an Englishman is worth little more than a Tartar or a Cossack; but to keep the channels open through which the life of the empire circulates, and which connect Britain with her wandering sons. Our aggrandizement is not one of territory, but of influence for truth and righteousness. America, where Anglo-Saxon enterprise is shaping the destiny of the New World, is as truly ours as is that eastern land where Anglo-Saxon vigour is breaking down decayed empires and breathing new life into the sluggish bosom of the Hindoo, or that great southern land from whose gold fields and prairies a mighty future is rising.

In all that we do, let us remember, that to deal justly and equitably with all men is not only the surest way of extending our dominion, but is its best defence against our enemies.

TRAPP'S IMPROVEMENTS IN CONNECTING AND DISCONNECTING SHAFTS.

(Patent dated July 18, 1855.)

Mr. T. Trapp, of Mile End, London, has recently introduced a very excellent arrangement for connecting and disconnecting screw propeller and other shafts. It consists in fitting to the ends of two shafts which it may be required to connect and disconnect, discs, a collar or ring, and keys or wedges, and in causing the connection

Fig. 2.

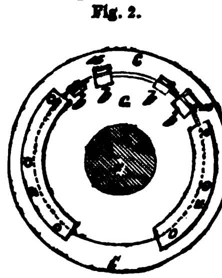


Fig. 3.

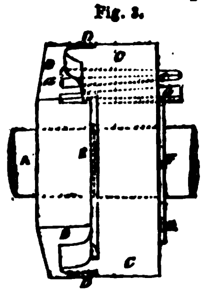


Fig. 1.

and disconnection of the shafts by tightening or loosening the keys or wedges at any portion of the revolution of either shaft.

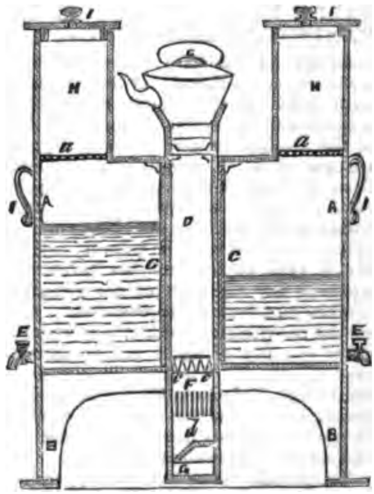
In the accompanying engravings is exemplified the manner in which he carries the invention into effect. Fig. 1 is an elevation of one side of the connecting and disconnecting apparatus, with a shaft (lead-

ing from a steam engine), in section; fig. 2 is an elevation of the reverse side of the apparatus, with a shaft (fitted with a screw propeller, paddle wheel, or other appliance), in section; and fig. 3 is a side elevation of the apparatus and shafts. A is the driving shaft; B is the disc, with arms or cross heads keyed or otherwise fixed thereon, and within a very short distance from the outer end thereof; C is a ring or collar, formed with channels, D, D, for receiving the ends of the cross head, B. The inside rim of this ring is also hollowed out for receiving keys or wedges, *a*, *a*, *a'*, *a'*. The position of these wedges is alternately reversed; the bases of the wedges, *a*, *a*, presenting themselves in the side view, fig. 2, while the bases of the wedges, *a'*, *a'*, present themselves in the view of the opposite side of the apparatus, fig. 1. E, E are flanges, forming part with or affixed to the ring, C, for preventing the disc on the shaft, hereafter described, passing through and out of the ring. The revolution of the shaft, A, carries with it the ring, C, and keys, *a*, *a*, *a'*, *a'*. F, fig. 2, is the shaft, which is described as the propeller shaft; it has fixed on it and close to the end thereof, a plain disc or wheel, G, which is to be made of such a diameter that it will just revolve within the ring, C, without touching it. *b*, *b*, *b*, *b* are clips, which lie upon the periphery of the disc, G, and slightly overlap it on both sides; they are placed under the wedges, *a*, *a*, *a'*, *a'*, and, like them, revolve with the collar, C. The propeller shaft, F, is placed on the same axial line as the driving shaft, A, and is brought up close to the end thereof, as shown by the dotted lines, fig. 3, which also brings the disc, G, within the collar, C; and in order to prevent it being drawn out of the collar in a direction from the driving shaft, the flanges or guards, H, H, are screwed on to the back face of the collar, as shown at fig. 2. The shafts and apparatus being in the position shown at fig. 3, will revolve independently of each other; but by driving the wedges, *a'*, *a'*, towards, and the wedges, *a*, *a*, from the propeller shaft, the disc, G, will become locked in the collar, C, and will consequently revolve with it; by simply reversing the wedges, that is, driving them respectively in a contrary direction, the disc will be free to revolve loosely in the collar, and consequently the driving and propeller shafts will be disconnected. The appliances to the shafts may be reversed; that is to say, the cross head and collar may be fitted on the propeller shaft, and the disc to the driving shaft, and the number of keys and clips may be increased or diminished, and the apparatus may be fitted to the end of any two shafts, in order to effect connection and disconnection between them. When this disconnecting apparatus is fixed upon the ends of shafts between a steam engine and screw propeller or paddle wheel, it will afford the means of almost instantaneous connection or disconnection between them, whether the vessel provided with it be in dock, in harbour, or at sea, and at any portion of the revolution of either shaft.

SADLEIR'S IMPROVED APPARATUS FOR HEATING LIQUIDS.

T. Sadleir, Esq., of Mulla Tullamore, King's County, Ireland, has recently patented an invention which consists in inserting a hollow vertical chamber, open at top and bottom, in or about the centre of any vessel suitable for heating liquids, and in placing therein a basket or case containing charcoal or other similar heating medium which will create little or no smoke. He provides apertures in the bottom of the basket or case for the admission of the air necessary to support combustion.

The accompanying engraving represents a longitudinal section of the improved apparatus. A, A is a vessel, made of metal or



other suitable material, supported on legs, B, B. This vessel is intended to contain the liquid to be heated, which is introduced through the cover, made to open upon hinges. The vessel may be rectangular, as shown, or of any other convenient shape. C is a partition, dividing the vessel vertically into two parts, one of which may contain coffee, for instance, and the other tea; E, E cocks, by which the contents may be drawn off; D is a hollow vertical chamber

or tube, open at top and bottom, and placed in or about the centre of the vessel, A, being fitted tightly therein, so that there may be no escape or leakage of liquids from the vessel; F is a basket or fire-box for fuel, fitting into the chamber, D. The exterior shape of this fire-box is the same as the interior shape of the chamber, D. At the upper part of the fire-box there is a flange or collar, *b*, which rests upon the top of the vessel, and prevents the fire-box from falling through; *c, c* are fire bars; *d, d* slits or apertures for admitting a supply of air to the fuel to support combustion; G is the ash-box, which is made to slide on to the bottom of the tube or chamber, D, beneath the fire bars, for the reception of the ashes from the fire; H, H are steamers, which may be let into the top of the apparatus, A. These steamers are made to fit accurately into the top, and have perforated bottoms, *a, a*, through which the steam rises from the vessel, and cooks any articles of food placed in the steamers. I, I are covers for the steamers. A frying-pan or kettle may be used over the top of the chamber, D. L, L are handles, by which the apparatus may be lifted or carried.

HALL'S IMPROVEMENTS IN THE MANUFACTURE OF GUNPOWDER.

At present the charges of a powder-mill are moistened with water at the commencement of the milling operation, which milling is continued for several hours, and as often as the charges become partially dry, they are again damped by sprinkling water over them by hand with a small watering-pot while the mill is in motion, but the distribution of the water is not always uniform or limited precisely to the quantity required. Mr. E. Hall, of Dartford, has therefore introduced into this part of the gunpowder manufacture certain improvements, which consist in arranging apparatus by which the exact quantity of water can be sprinkled over the charges in a given time, and continued with little variation for an indefinite period, by which means the charges are better worked, the loss from dust is diminished, and less risk of accident is attained.

To provide water for the apparatus, a small pump, with slow motion, is used to raise a supply to a cistern sufficiently elevated for the distribution of the water by means of small pipes to all the mills which are contiguous, each of the mills being provided with a smaller cistern fixed to the stone shafts, and revolving with them. Each of the shaft cisterns in the mills is provided with a float valve for admitting a regular supply of water to them, so that the head of water of the sprinkling pipes is maintained in each case at an uniform elevation, which facilitates the adjustment of the quantity of water to be expended on the charges. From the shaft cisterns the water is conducted through small pipes down to near the surface of the mill beds, where a perforated pipe attached to the stone shaft revolves and distributes the requisite quantity of water over the charges. To regulate with precision the quantity of water to be expended on the charges, a cock is provided with a small aperture, and also an index, so as to be capable of nice adjustment; and below this regulating cock a stop-cock is provided for shutting off the supply of water from the sprinkling pipes during the time the charges are taken off and others laid on the mill beds. A steam pipe from a boiler is conducted into the water of the shaft cisterns when it is required to be heated for the mill charges, and the steam supply is regulated by a cock, as required.

HANSON'S MACHINE FOR DIGGING POTATOES.

Mr. J. Hanson, farmer, of Doagh, Belfast, has recently introduced an apparatus to be used for digging or removing growing potatoes from the earth, as a substitute for the ordinary hand-fork, the object being the more rapid and economical removal of the roots. The implement consists of a light, open, timber frame supported on four running wheels, the motion of the main axle being applied to the driving of an arrangement of rotatory digging forks. It is drawn by a pair of horses attached to a transverse bar, at the end of the frame opposite to the forks, the connection being similar to that usually adopted in the common plough. The end transverse bar projects at one side, and serves as a handle for turning the machine at the headlands. The front pair of running wheels, next the horses, are of large diameter, and are furnished with radial spikes on their peripheries, so as to have a firm hold upon the ground in revolving, and thus provide sufficient resistance for the fork-driving action. The main axle, revolving with these large running wheels, carries a toothed bevil wheel, in gear with a bevil pinion fast on the forward end of a horizontal shaft, supported in bearings in the centre of the hind part of the frame. The opposite end of this shaft projects slightly at the extreme rear of the frame, at which part it has upon it two or more radial rotating forks, which of course revolve in a plane at right angles to the line of the implement path. At the part of the frame immediately behind the small back running wheels there is attached a horizontal plough piece, slightly inclined

on its upper surface, the rear portion of which is just clear of the forks as they work round. This plough piece, which is adjustable vertically to suit the depth of action required, passes along beneath the drill of potatoes deep enough to lift up both the manure and the potatoes. In this way, as the manure and potatoes are elevated upon the incline, the rotatory action of the forks scatters out the potatoes, which can then be easily removed. Provision is made for allowing one of the large driving wheels to turn back, to facilitate the turning of the implement at the end of a drill.

NEW METHOD OF GENERATING STEAM.

[We have received the following communication from Dr. Payerne, Ex-President of the Scientific Class of the Athenæum of Paris, and Ex-President of the Society of Natural Sciences, &c., Cherbourg.]

On the 16th of the present month, an experiment was conducted at the Conservatoire des Arts et Metiers of Paris, which has just added a new element of destruction to those already in use in naval warfare.

The object of the experiment was to generate steam from water by means of an hermetically closed furnace; that is to say, a furnace without any supply of air, and in which recourse was not had to any draught of atmospheric air to effect or support combustion.

The experiment was unfortunately stopped by a leakage, arising from the weakness of a joint which yielded to pressure, but nevertheless lasted a sufficient time to remove all doubt as to the success of the plan, the only objection to which is, that its cost is 2*s*. per horse power per hour.

Without going into more precise details at present, I may state that the principal feature of the process consists in substituting an azotate in a close furnace for a current or draught of atmospheric air in a boiler of the usual construction. I prefer azotate of soda, because it contains a large quantity of oxygen, leaves very little residiuum, and is cheaper than the azotate of potassa.

TRURAN'S IMPROVEMENTS IN BLAST FURNACES.

Heretofore, in supplying blast furnaces for the reduction of iron ores with the requisite blast, or atmospheric air under compression, for maintaining the active combustion of the fuel, one or more cylindrical or cylindri-conical blast pipes, termed "nozzle-pipes," are disposed around the hearth, or lower portion of the interior chamber of such furnace, from each of which nozzles issues a single undivided jet or stream of air under a certain pressure. This air passing through the tuyere provided for the purpose, enters the interior chamber of the furnace, and eventually escapes at the top, through that portion of the chamber above the boshes known as the throat or filling-mouth, which is constructed of a diminished breadth, its diameter being such that the superficial area on the plan section, in all furnaces hitherto built, is less than one-half of the area of the diameter of the furnace at the upper bosh line.

Mr. W. Truran, of Marazion, Cornwall, has recently improved upon this arrangement. According to his invention the internal bore of the blast-nozzle is divided in such manner that it shall deliver a divided jet into the interior chamber through the same tuyere, the pressure temperature, and general qualities of the blast delivered by the different jets being either alike or dissimilar, as may be advisable, and of such form and relative proportions as the peculiar circumstances of the furnace and materials consumed may require. He also constructs the throat or mouth of the interior chamber through which the decomposed blast escapes into the atmosphere, and of so much of the interior chamber as lies above the boshes, of a breadth equal to, or in excess of, the breadth of the chamber at the upper bosh line, and of an area in the plan section equal to or in excess of the area at the upper bosh line.

WATSON'S IMPROVEMENTS IN THE MANUFACTURE OF COKE.

Mr. H. H. Watson, analytical chemist, of Bolton-le-Moors, has recently patented an invention which consists in subjecting coal to the action of hydrochloric, or muriatic acid, and afterwards burning into coke the coal so treated. This may be effected with coal either in lumps or in a small or ground state, though it is best done with small or coarsely ground coal. The acid may be diffused or allowed to permeate amongst the coal whilst the latter is lying in a heap, or the coal may be immersed in the acid in a cistern pit, or other suitable receptacle capable of holding liquid, using materials for the construction of the cistern or receptacle (where such is used), which shall be least liable to the corrosive action of the acid.

The mixture or contact of the coal and acid should be continued till it is found that the carbonates of lime and magnesia, and other earthy impurities contained in the coal, and capable of being dissolved by the acid, have been well and sufficiently acted upon thereby. This may be known

by the effervescence or evolution of gas having ceased, and not being resumed by the further addition of acid to the coal, or by finding that such effervescense having ceased, some of the liquid drawn off from the coal causes effervescence, when poured on chalk or other carbonate of lime.

Either pure hydrochloric or muriatic acid, or the impure and refuse acid produced at soda-ash and other manufactories, by the action of sulphuric acid on chloride of sodium or common salt (and which refuse acid is frequently sold at a very low price, and often allowed to run away to be got rid of) may be used for the purpose of carrying the invention into effect. Other acidulous liquids may be used, which contain so much hydrochloric or muriatic acid in excess, or in a free or uncombined state, as to cause effervescence when added to carbonate of lime.

SPECIAL MUSEUMS FOR THE WORKING CLASSES.

We have before directed the attention of our readers to the movement made in connection with the Society of Arts, for the purpose of improving the homes, &c., of the working classes throughout the world. We now learn, by papers received from Brussels, that an Exhibition, in furtherance of the same object, is to be held in that city during the ensuing year. We are much gratified to find that the zeal and ability of Mr. T. Twining, jun., of London, with whom this highly important movement originated, are cheerfully and fully recognised on the Continent. We have not space to describe the arrangements that have been made for the carrying out of this Exhibition; but we may announce that, in connection with it, a *Congrès International de Bienfaisance* will be opened in Brussels, on the 15th of September next. We strongly recommend the Exhibition in question to the notice of our readers, and hope that they will not be backward in contributing to it objects, designed to improve either the dwellings, the furniture, the food, or the clothing of the working populations. Further information upon the subject may be obtained, on application to the Secretary of the Society of Arts.

EXAMINATIONS OF THE MEMBERS OF MECHANICS' INSTITUTES, ETC.

We desire to call the attention of the members of classes connected with mechanics' institutes, literary and scientific institutions, and athenæums, in union with the Society of Arts, to the fact that the Council of that society have resolved to hold examinations at which certificates of merit shall be duly awarded. The first series of examinations is to be held in June next, at the Society's house, Adelphi, London. An opportunity is thus afforded for young men of superior ability to secure a public recognition of their talent and industry—a recognition which, in many instances, will assuredly lead to substantial benefit. Money prizes are to be distributed, but these will be of much less value than the patronage with which distinguished merit will in all probability be rewarded. *The Journal of the Society of Arts* for February 15th and 22nd, and succeeding numbers, should be consulted for full information.

THE SMOKE QUESTION.

To the Editor of the Mechanics' Magazine.

I was unable to continue the subject of my letter, contained in your Journal of the 9th, in the succeeding number, as I had promised to do. In that I alluded to the present use of double furnaces as a means much in favour among practical men for the purpose of consuming smoke. The plan resolves itself into this simple question. Is it possible to burn or consume visible smoke, or the gaseous invisible products from one fire, by passing them over the incandescent portion of another? I answer, most emphatically, No! It is altogether impossible; contrary alike to both theory and practice. How then is it that such an arrangement should not only be proposed and advocated, as we find in your journal, by the letters of late, but that the employers of such contrivances offer their testimony, and doubtless a most truthful one, that by this means they consume the smoke? But they do not inform us at the same time whether this is economically effected, whether the quantity of work yielded by a given weight of coal is what may be considered efficient, or whether, indeed, the use of double fires is attended with a greater or less consumption of fuel.

To prevent smoke is no great matter after all, when we have at hand the anthracite and other smokeless coals and coke, which, at a cost, may be equally serviceable for steam generating purposes, and entirely remove all unhealthy nuisance arising from the visible products of coal in a state of combustion. I have been consulted much of late, on removing not only smoke, but also the noxious vapours arising from certain processes in the arts, such as varnish and printing-ink manufactures, and I have noticed in general amongst these a modification of the plan to which I am

now alluding, for the removal or consumption of their smoke; this consists of a fire grate erected in the main shaft, which is kept continually supplied with ignited fuel. The flues from the boiler, copper, &c., conduct their contents to the main shaft, but before entering this, they have to pass over or through the fire there situated. This, I am informed by these parties, is found answerable, and to meet the satisfaction of the "Smoke Inspectors." But is not this very much like lighting a candle at both ends, and far from an economical practice? But some will argue the double furnace is different, because, both being beneath the boiler, they both must give out their effective heat to the water in the boiler. This is not so! Let us first inquire "What is smoke?" we may then understand what conditions are required for the economical removal of this unpleasant, but constant attendant upon manufacturing neighbourhoods. "Smoke is the visible and sooty effluvium from burning bodies generally;" this is visible, and as I have stated may be removed by various simple processes. At Cubitt's works, for instance, it is conducted over water, the gases become cooled down, and being no longer able to hold up the smoke or sooty exhalation, the heavy carbon deposits at the bottom of the shaft instead of escaping up the chimney. But where is the economy here, when all such deposit is as effectually lost as though it had ascended in the usual way, so far as its value of heat is concerned? It is a mistake to think that smoke is lighter than air; it is specifically more dense and heavier, and therefore is easily deposited when the products are cooled. Hence the annoyance resulting to the neighbourhood of a smoky chimney, whether escaping, or cooled before escape, the waste is the same.

But beyond these points, the most important consideration to regard is not only, Can you remove the smoke nuisance? but, Can you effect the perfect combustion of the products arising from the combustion of coal? These products, consisting of the visible black sooty exhalation of finely divided carbon set free by the decomposition of the hydrocarbons formed during the coking of the coal, of light carbo-hydrogens, of carbonic oxide and carbonic acid, are many of them capable of furnishing, under judicious circumstances, a very considerable amount of heat. The only products arising when perfect combustion is proceeding, should be, free nitrogen, water, and carbonic acid, besides those resulting from attendant accidental impurities in the coal. To effect this perfect combustion, a full complement of pure air must be supplied to the gaseous products, and they must altogether be at a proper temperature before combination can take place. These conditions are not found in an ordinary furnace. The heat applied to the coal causes the decomposition of the coal itself, but at the same time forms new compositions. The hydrogen passes off, carrying with it carbon in solution, principally as olefiant gas, or heavy carburetted hydrogen invisible; these become cooled by contact with the boiler surface, and partly creep away unconsumed to the chimney; other portions, being inadequately supplied with air, are decomposed by the red-hot fuel, and deposit a portion of their carbon, which escapes unconsumed, and in a *visible* state appears in the chimney. The air supplied through the ashpit comes in contact with the heated fuel on the bars, effecting at that point perfect combustion; but in penetrating upwards to the surface and through the fuel, the products resulting from this first combination become themselves decomposed, taking up and carrying away the carbon in an imperfectly combined state, as carbonic oxide; for carbonic acid is decomposed by contact with red-hot carbon absorbing that carbon, and becoming itself reduced to a minimum state of oxidation, or carbonic oxide. Olefiant gas passing over heated fuel, or being unprovided with a sufficiency of air, also deposits one proportion of its carbon in an unaltered state. It is known that the amount of heat given out is as the amount of oxygen consumed, and that this amount is double when perfect combustion of these products is effected.

The double fires plan is therefore easily understood, and why it removes the visible black exhalations; the second fire serving only to heat up the visible carbon and carbonic-acid mixture from the first, to cause the one to absorb the other. This certainly renders them altogether invisible; but during the decomposition of the carbonic acid and the formation of two proportions of carbonic oxide, an absorption of heat actually takes place, and although they escape invisibly, they would, with proper treatment, yield large results—that is, if fully oxidated in the furnace. The supply of air is important, as also the proper place for that supply. Mr. C. W. Williams has most judiciously handled this point, nor can his opinion be departed from with any good result; nor is this the opinion of one alone, but of all scientific and learned men, as well as those who have learnt the practical results. Supplying air to the front of a furnace, even if we allow that perfect combustion results at the front portion, cannot prevent the products arising from the front suffering decomposition while passing over the latter and heated portion of the fuel on the fire-

grate. To consider that the supply is only required while the green fuel is present, is quite a mistake, as the incandescent fuel or heated carbon requires throughout its combustion full and adequate supplies constantly furnished to prevent its escape as carbonic oxide.

I fear I have now wandered to such an extent as may render this matter of an inconvenient length. I will therefore crave a space in a future number, in which I purpose describing an arrangement found competent to meet the conditions required.

I am, Sir, yours, &c.,

THE INVENTOR OF
GARDNER'S PATENT SMOKE CONSUMER.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BOASE, H. S. *Improvements in the process of drying organic substances.* Patent dated July 17, 1855. (No. 1603.)

This invention consists of three passages or tunnels, along which lines of railway are laid for wagons containing the matters to be dried to run on; these wagons are run in at the open end of the first tunnel, which is traversed by a current of cold air, by which the drying is partially effected. When the wagon arrives at the end of this first tunnel, it is withdrawn by a door at the end, and is then introduced into another tunnel, which is traversed by a current of heated air, by which the matters are completely dried, and therefore in some parts overdried; to obviate this, the wagon passes into the third tunnel, through which the current of air passes which has previously traversed the first tunnel.

BURDESS, A. *Improvements in the construction of oil-feeders for lubricating machinery.* Patent dated July 17, 1855. (No. 1604.)

This improved oil-feeder consists of an ordinary oil can (as used by engineers, with a long spout). In the body of the can the inventor places a spring which is connected at one end to a valve in the spout and at the other to a bell-crank acted upon by a thumb-screw from the outside of the can. It also contains a strainer at the supply-valve, to prevent dirt getting in the body of the feeder.

THURGAR, W. C. *The preservation of the fluid substance of fresh eggs.* Patent dated July 18, 1855. (No. 1608.)

In this invention the fluid substance of the egg is deprived of its water by evaporation, before the atmosphere changes it, by means of a stream of air, and by means of heat moderated and conveyed through steam pipes placed under trays containing the fluids ubstance, and after evaporation the dried substance is reduced to powder by grinding in a mill driven by any suitable prime mover.

[The three preceding abstracts should have appeared on page 184 of last week's Number,]

JOHNSON, J. H. *Improvements in the manufacture of reeds for weaving, and in the machinery or apparatus employed therein.* (A communication.) Patent dated July 19, 1855. (No. 1635.)

This invention relates to certain improved constructions and arrangements of reeds for weaving purposes, which it is proposed to make of hard India-rubber and gutta percha combined, or of India-rubber combined with metal or other materials.

ISOARD, M. F. *Improvements in apparatus for generating steam, and for applying the same to motive power purposes.* Patent dated July 19, 1855. (No. 1637.)

This invention consists of improvements upon a former patent dated August 28, 1848. In one arrangement the generator consists, as in the first patent, of a coil of pipes, and the first modification made therein consists in rendering the furnace stationary, the necessary draught being caused by the escape of steam into the chimney. In order to obtain increased effect from the furnace the coil of pipes is made conical.

STOCKER, S. *Improvements in water-closets and in pumps and cocks for supplying water to the same, and for other similar purposes.* Patent dated July 19, 1855. (No. 1638.)

The inventor claims certain described arrangements of parts, and the use of portable basins in any stationary water-closets, if the same can be removed without interfering with the water way.

CUNNINGHAM, H. D. P. *Improvements in reefing sails.* Patent dated July 20, 1855. (No. 1640.)

A description of this invention will shortly be given.

JOHNSON, J. H. *Improvements in machinery or apparatus for obtaining motive power; applicable also to the raising, forcing, and exhausting air and other fluids, and partly to the kneading or working of dough and other pastes.* (A communication.) Patent dated July 20, 1855. (No. 1642.)

These improvements consist of certain rotatory apparatus composed of two revolving cylinders fitted each with spiral grooves and projections which gear together. They may either both be made projecting from the cylindrical surface on which they are formed, or one only may project, whilst the other spiral is simply a

groove in which the projecting spiral works. The cylinders rotate in a suitable chamber.

CONNER, G. *An improvement in the manufacture of brushes.* Patent dated July 20, 1855. (No. 1644.)

Claim.—The application to the manufacture of brushes of the fibres obtained from the "Agave Americana," or "Mexican grass."

DESCHAMPS, C., and C. VILCOQ. *A free diving boat.* Patent dated July 20, 1855. (No. 1646.)

This invention relates to a diving boat, which may be freely directed backwards and forwards at the surface or at the bottom of the water by the operator shut up in the same, by means of a screw or helix and a rudder, both set in motion by means of gear wheels arranged inside so as to be worked by the hand of the operator.

STRIBY, W. *A new and improved system of musical notation.* Patent dated July 21, 1855. (No. 1648.)

This invention comprises—1. A universal system, intended to reduce all the different musical clefs, scales, and systems to one single scale, or a single system of scales. 2. A new shaped set of clefs, by which a given note will retain the same relative position upon the staves, &c., for all instruments and clefs. 3. The use of more than five lines in a stave. 4. The use of a union line rendered conspicuous from the other lines of the stave by size, colour, or in any other suitable manner, to allow the performer to distinguish more readily the position of the notes, &c.

FONTAINEMOREAU, P. A. L. DE. *Certain improvements in the construction of voltaic batteries.* (A communication.) Patent dated July 21, 1855. (No. 1649.)

This invention consists—1. In an improved construction of voltaic battery. 2. In a method of protecting the electrotyped portion of the carbon element from the action of acids. 3. In the employment of paper prepared in the same manner as gun cotton as a substitute for a porous diaphragm.

TOOTH, A. *A process for preserving and curing by salting the flesh and hides of animals in an entire state.* Patent dated July 21, 1855. (No. 1650.)

This invention consists in forcing saline substances into the veins and arteries of flesh and hides.

MYERS, E. *Improvements in buffers and other springs for railway and other carriages.* Patent dated July 21, 1855. (No. 1653.)

This invention consists in fitting two or more helical springs in a suitable spring box or casing, each spring being placed in a separate compartment of its own, and such compartment being concentrically arranged so that the inner springs will be of smaller diameter than the outer ones. The inner end of the buffer-rod has formed on it projections corresponding with and fitting into the chambers containing the springs. The springs gradually increase in length, so that they are brought into action successively.

PITTAR, S. J. *Improvements in the construction of bridges.* (Partly a communication.) Patent dated July 21, 1855. (No. 1655.)

This invention consists in constructing bridges by combining several systems of diagonal bracings with posts or perpendiculars, in such manner that a weight coming on one of the systems of which a truss-formed bridge consists, when constructed according to this invention, is not only transferred over that one system, but over and through the whole of the systems, before it is brought to the piers.

WREN, J. W. C. *An improved construction of folding perambulator.* Patent dated July 21, 1855. (No. 1657.)

This invention relates to a perambulator, which admits of being folded up into a small compass for transport.

HEPPLEWHITE, G. *Improvements in spare rudders for ships.* Patent dated July 21, 1855. (No. 1659.)

The inventor erects a standard about six or seven feet high on the deck, close to the trunk hole of the rudder; this is fitted into a shoe or clamp firmly bolted to the deck, and is further stayed from the top in several directions, in order to render it fixed. This standard is fitted with bearings near its top and bottom to receive the head of the spare rudder. The whole weight of the rudder is supported by a shoulder on the standard.

KELK, T. H. H. *Rendering certain vegetable substances useful for the manufacture of paper and the formation of textile fabrics and cordage or ropes.* Patent dated July 23, 1855. (No. 1661.)

This invention consists in certain methods of treating "the fibres extracted from the bark of elm, of lime, of poplar, of willow, and of marsh-mallow canes or rods; the leaf-stalk of horse-radish, and the root of horse-radish; the shrubby cane or rod of marsh-mallow; the wood of elm, of poplar, of willow, and of lime."

RIPLEY, H. W. *Improvements in dressing and finishing woven fabrics composed wholly or partly of wool.* (Partly a communication.) Patent dated July 23, 1855. (No. 1662.)

This invention relates principally to a mode of treating woven fabrics composed wholly or partly of wool, so as to free them from loose knots and at the same time raise the nap or fibre. For this purpose the goods

are passed through a machine similar to those commonly used in cloth-dressing, for the purpose of keeping the cloth at tension while under operation; and while at tension they are subjected to the action of fine steel combs, which are caused to act upon the fabric in a line nearly parallel to its surface.

ACHARD, A. *Improvements in the application of electricity as a transmitting agent of motive power.* Patent dated July 22, 1855. (No. 1668.)

The inventor describes certain improvements capable of various applications, and selects as illustrations of their adaptation, first, means for retarding and stopping trains on railways; second, means by which the winding of silk may be facilitated.

ROLLET, G. H. *Improvements in projectiles for fire-arms.* Patent dated July 23, 1855. (No. 1669.)

This invention consists of shot or projectiles having a cylindrical body, and the front or fore end formed with a conical-shaped point, and the hinder or breech end thereof having a truncated conical form, the base springing from the hinder end of the cylinder body (or centre portion) of the shot. Each end of these projectiles is furnished with a ring, sabôt, or packing, which fits the bore of the gun, and which has a slit formed in it to allow it to expand laterally when rammed home.

RITTERBANDT, L. A., and J. BOWER. *An improvement in the manufacture of manure.* Patent dated July 24, 1855. (No. 1671.)

This invention consists in manufacturing manure by employing powdered clinkers in combination with acids such as are employed in developing phosphoric acid when acting on phosphates.

WESTWOOD, J., and R. BAILLIE. *Improvements in preserving timber-built ships, also timber, or wood and wrought iron, used in situations exposed to the action of water or of weather.* Patent dated July 24, 1855. (No. 1673.)

This invention consists in applying to the wood or iron used for such purposes a preparatory coating of black varnish, or other composition having similar properties thereto, and afterwards a coating of asphalte or bituminous composition.

STENT, H. *Improvements in the construction of apparatus for measuring gas and other fluids.* Patent dated July 24, 1855. (No. 1674.)

This invention relates to the common wet gas-meter.

Claims. — 1. Forming the body of the case and foot of sheet iron or other metals by stamping. 2. Coating the surfaces of sheet iron or other metal employed in the construction of gas-meters with an alloy of tin and antimony. 3. A mode of transmitting motion from the measuring-drum shaft to the registering mechanism, by means of an eccentric cylinder or crank-pin revolving between guides attached to a pendulum rod connected to the registering mechanism. 4. Arranging the internal valve to open outside the valve box. 5. Fixing an inverted cap over the spindle tube to protect the registering mechanism from corrosion. 6. Casting the syphon and dry well in one entire body.

WOOD, B. *An improved preparation of colouring matter for the manufacture of ink, artist's colours, and for other purposes for which such colouring matter may be applicable.* Patent dated July 24, 1855. (No. 1676.)

In order to produce a colouring matter to be employed in the manufacture of a non-corroding ink, the inventor takes about 9 ounces of carbonate of soda, and dissolves it in 27 quarts of water, to which are added about 8 ounces of citric acid; and when this solution has been brought to the boiling point, 1½ lbs. of cochineal are added, and the boiling is continued for 1½ hours; after which the liquor is strained, allowed to settle, and cool. The clear liquor is then again boiled, 9½ ounces of common alum are added, the boiling is continued for a few minutes, and the liquor is drawn off into coolers and allowed to settle for two or three days. The supernatant liquor is then drawn off, and the precipitate is filtered, washed in distilled water, again filtered, and finally dried. If required in a liquid state it is subjected to the action of a solution of caustic ammonia.

JOHNSON, J. H. *Improvements in breech-loading and self-capping fire-arms, and in percussion caps or primers, and in the mode of applying such percussion caps or primers to fire-arms.* (A communication.) Patent dated July 24, 1855. (No. 1677.)

These improvements consist mainly in constructing breech-loading fire-arms (of the Faucet Breech class) in such manner as to prevent the clogging or fouling of the moving parts, so that the arm may be readily opened and closed in the breech after rapid and repeated discharges; and so as to compensate for the wear of the moving parts under use.

JOHNSON, J. H. *Improvements in breech-loading ordnance and fire-arms, and in their projectiles.* (A communication.) Patent dated July 24, 1855. (No. 1678.)

This invention consists mainly in a mode of opening and closing breech-loading ordnance and fire-arms by means of a compound or double-jointed lever, whereby

greater power is obtained than by an ordinary lever, and in the employment of iron bullets, shot, or shell.

BROOMAN, R. A. *An improvement in machinery for making pipes and tubes.* (A communication.) Patent dated July 24, 1855. (No. 1680.)

This invention consists in an improvement in the construction of the roller dies for making seamless metal pipes and tubes, for which letters patent were granted to the patentee, March 5, 1853. (See *Mech. Mag.* vol. lix. p. 231, No. 1571.) The present improvement consists in bevelling off or otherwise cutting away the corners of each of the rollers, so that a series of grooves will be formed around the inner circumference.

PETITJEAN, T. *Improvements in silvering, gilding, and platinizing glass.* Patent dated July 24, 1855. (No. 1681.)

This invention consists in coating glass with solutions or products obtained by combining vegetable acids or hydracids (or these combined with chlorine, iodine, or bromine,) with metallic salts of silver, gold, or platinum, the bases of which are combined with mineral acids or hydracids. An alkali must be mixed with the metallic salt, or with the vegetable acid.

HEWITT, T. *Improvements in pumps.* Patent dated July 24, 1855. (No. 1682.)

A description of this invention was given at page 179 of our last Number.

HUTHNANCE, R. P. *Improvements in drying, and in apparatus to be used therein.* Patent dated July 24, 1855. (No. 1683.)

At one end of the room the patentee constructs a stove or furnace with an iron-grating door, and hot plate; at the back of the furnace is a horizontal flue, with fire bricks to convey the flame and smoke from the furnace to iron pipes (laid in a horizontal direction, or nearly so, and within a short distance from the floor) through the centre of the room, by which means the heat in the drying room is produced. Within and around the flue, at the back of the stove is an iron boiler for heating water, of the same form as the flue, and so made that the flame and smoke can pass through the flue, surrounded by the boiler, to the pipes at the back, by which means the water becomes heated; but this boiler is omitted when hot water is not required. The door to the furnace is constructed double, so as to economise the heat as well as preserve the door, and in order to regulate the draught of the furnace, a door is put to the ash-pit, and a sliding ventilator introduced therein. The pipes are placed side by side and over each other, at a short distance from the floor; and in order to assist the draught, they are slightly inclined from the flue up to the chimney. At a little distance above the pipes a platform of stone is laid upon longitudinal iron bearers, in order to protect from injury by the over-heating of the pipes the articles proposed to be dried.

The stove or furnace is constructed in the following manner: The bottom or grating is formed with loose cast-iron bars, let into an iron frame, and built in brickwork. The flue at the back of the furnace and next to the drying-room, is covered with stone, and in the front of the furnace is fixed a double iron door and frame. Over the top of the furnace is fixed a hot plate with cast iron frame, and three cast-iron flaps; the frame and each of the flaps are rebated and fitted together sufficiently loose to allow for the expansion of the metal, and, at the same time, close enough to prevent the smoke and flame from the furnace passing through the joints. This hot plate is intended to receive the flat-irons proposed to be heated in a room adjoining the drying room, and to which the hot plate is open, and an arch is thrown over the same in brickwork.

BAILEY, B. *Improvements in manufacturing knitted fabrics.* Patent dated July 24, 1855. (No. 1684.)

In a previous invention Mr. Bailey combined Derby rib machinery with knitting-frames, so that the two were worked with a rotary motion, and one presser-bar was so moved as to press on the beards both of the frame needles and machine needles. The present improvements consist in employing two stationary presser-bars, one for the frame needles and one for the machine needles; the two sets of needles being respectively moved to bring the beards of their needles against their respective presser-bars.

BOUSFIELD, G. T. *Improvements in cutting wood.* (A communication.) Patent dated July 24, 1855. (No. 1685.)

These improvements consist in combining in one mortise chisel a number of cutting edges, each one of which cuts only as much as steel edges ought to cut, and which are so arranged as to follow each other in immediate succession, gradually widening the mortise until the desired width has been attained.

SCULLY, V., and B. J. HEYWOOD. *Improvements in vessels for containing and preserving fluids.* Patent dated July 25, 1855. (No. 1690.)

Claims.—1. The application to vessels for preserving fluids of an air-tight floating piston. 2. The construction of inkstands wherein the rise and fall of the ink to and from the ink cup is effected by the action of gravity. 3. In fountain inkstands, a me-

thod of mounting the dipping cup on a hollow piston rod.

WEALLENS, W., and G. A. CROW. *Improvements in steam engines.* Patent dated July 25, 1855. (No. 1691.)

The principal feature of this invention consists in the taking of the whole or any part of the force of the piston or pistons through one or any number of the pumps which necessarily form part of every steam engine, and then bringing this force back to the cranks and main shaft, which are placed between the cylinder or cylinders and the pumps.

DAVIES, D. *A self-evident economic boiler for heating with hot water buildings of every description.* Patent dated July 26, 1855. (No. 1692.)

The principle of this invention consists in exposing large surfaces and small thicknesses of water to the action of heat. The boiler is composed of pans placed one within the other. The curved bottom of the lower pan is concave throughout the length of the boiler. The sides of the outer pan and a hollow set-off or flanch forms the return flue by which the flame is made to pass entirely round the sides.

SCHIELE, C. *Certain improvements in obtaining and applying motive power.* Patent dated July 26, 1855. (No. 1693.)

Claims.—1. A peculiar construction of induction overtures or tangential openings. 2. A peculiar construction of adjustable induction apertures or tangential openings. 3. A peculiar construction of runner and its annular chamber.

BEATTIE, J. *A combination or contrivance of a folding mattress (with or without a tent attached), hut, ambulance for conveyance of wounded or sick persons, pontoon-raft and boat, portable cistern and bath.* Patent dated July 26, 1855. (No. 1695.)

This invention consists of a mattress made in five compartments or divisions, that is to say, one centre piece (which may be subdivided), two side pieces, and two end pieces, all connected, so as to allow of its being adapted to the required forms for the several purposes above mentioned.

PONCELIN, T. A. *Improvements in treating or preparing coffee.* Patent dated July 26, 1855. (No. 1698.)

This invention relates to so distilling roasted coffee as to obtain "a fixed solid basis without residuum or grounds, and perfectly soluble in water, a liquid, pale, limpid volatile aroma; and the following products resulting from either the solid basis or the liquid aroma, viz., a product to be termed coffee-butter (beurre de café) and liquid coffee."

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

WHITE, A. *Swinging beds and covers and tents, to enable soldiers and others to sleep off the ground, and dry, with or without an ordinary tent.* Application dated July 20, 1855. (No. 1641.)

In the first part of this invention a bed frame for sixteen men is suspended on four tripod stands of wood, or metal piping; each stand formed of three legs is so jointed together at top as that, when not in use, they will lie close together, each leg, if of wood, having at its other end a ferrule forming a fork.

JOHNSON, J. H. *Improvements in axles for railway and other purposes.* Application dated July 20, 1855. (No. 1643.)

In this invention, the wheels are fast on the axle, but each has a separate and independent movement of its own. The improvements consist in forming the axle of two parts united by a suitable coupling-box in the centre of the axle.

MOLL, F. *The employment of new materials in the manufacture of paper.* Application dated July 20, 1855. (No. 1645.)

Fibres obtained from the potatoe, the fir-tree (and other cornifera), and cotton or linen rags are the "new materials" (!) mentioned by the inventor.

FEAU-LEFEBVRE, E. *Improvements in obtaining motive power.* Application dated July 20, 1855. (No. 1647.)

This invention is based upon some advantages supposed to be derived from the employment of a vacuum formed in an inverted tube.

PERRY, G. H. *An improvement or improvements in vessels or cases to be used for the preservation of articles of food.* (A communication.) Application dated July 21, 1855. (No. 1651.)

The inventor constructs cases having on the top a short neck fitted with a cup-like flange capable of holding any liquid or fused solid substance. The neck is closed by a cap with a screw on its interior, which takes into a corresponding screw on the exterior of the lower part of the neck. The cap is screwed on by a spanner furnished with holes, into which projections on the cap take, and an India rubber or other washer is placed in the cap.

MCLAREN, R., and S. W. PUGH. *Improvements in the manufacture of artificial fuel and fire-lighters, and in moulds to be employed therein.* Application dated July 21, 1855. (No. 1652.)

The inventors propose to manufacture fuel from spent tan, cow-dung, cocoa-nut fibre, saw-dust, coke, coal-dust, resin, oils, naphtha, pitch, and nitre, and fire-lighters from the same substances, omitting the coke

and coal-dust. The moulds are formed with cones and false bottoms.

GOODYEAR, C. *Improvements in the surfaces used for printing.* (Partly a communication.) Application dated July 21, 1855. (No. 1654.)

The object of this invention is "to apply hard manufactures produced by compounding India-rubber and sulphur, with or without other matters, whether in printing from surfaces or plates."

DUGDALE, A. *An improvement in the construction of locomotive engines.* Application dated July 21, 1855. (No. 1656.)

This invention consists of an improved mode of retarding and stopping locomotive engines on railways by the aid of the steam. To this end an additional steam way from the valve-box to the working cylinder is provided, and steam is admitted to both sides of the piston simultaneously.

KENWORTHY, W. E., and H. GREENWOOD. *Improvements in the construction of screw propellers.* Application dated July 21, 1855. (No. 1660.)

These improvements relate to fixing the blades of screw propellers to the boss or centre which is fixed on the shaft, and consist in forming dovetailed recesses in the boss, and corresponding dovetails on the blades.

GOODYEAR, C. *Improvements in the manufacture of wheels for carriages, and other vehicles where India-rubber is used.* Application dated July 23, 1855. (No. 1663.)

This invention has for its object the manufacture of wheels for carriages and other vehicles of the hard compounds of India-rubber, with or without metal.

GOODYEAR, C. *An improvement in manufacturing moulded articles made of compounds of India-rubber.* (A communication.) Application dated July 23, 1855. (No. 1664.)

This invention consists in introducing water or other fluid into the mould with the compound of India-rubber, by which means, when the mould is subjected to heat, to produce the change in the India-rubber compound, the water or fluid will be expanded into steam which will force the India-rubber into all the parts of the mould.

GOODYEAR, C. *Improvements in bands or straps for confining or holding papers or documents and other articles where India-rubber is used.* Application dated July 23, 1855. (No. 1665.)

This invention consists in making such bands or straps partly of vulcanized India-rubber, where it is desired that the bands or straps should be elastic.

GOODYEAR, C. *Improvements in the manufacture of combs.* Application dated July 23, 1855. (No. 1666.)

These improvements consist in introducing metal into the interior of India-rubber combs to give strength thereto.

GOODYEAR, C. *Improvements in the manufacture of boats and other vessels.* Application dated July 23, 1855. (No. 1667.)

This invention consists in combining and cementing together sheets and parts of hard compounds of India-rubber into the form of a boat or vessel.

CRAIG, W. G. *Improvements in the mode or method of consuming smoke, and in the machinery or apparatus employed therein.* Application dated July 24, 1855. (No. 1670.)

In locomotive or other boilers it is proposed to fix a tube to connect the mid-feather or division in the fire-box, by means of which the fuel is conveyed into the inner chamber of the fire-box. The said tube is to be in combination with an outlet forming a water space.

BRADLEY, L. *Improvements in reaping machines.* Application dated July 24, 1855. (No. 1672.)

The cutters used are somewhat of the form of "sickles" applied to wheels or discs of which there is a series, caused to rotate by means of bands or straps from a drum on the main axle acting upon pulleys on the axles of the discs or wheels.

TWIST, S. *An improvement or improvements in producing ornamental inscriptions and devices on glass.* Application dated July 24, 1855. (No. 1675.)

This invention relates to such inscriptions and devices as are produced on the back of a sheet or plate of glass. The inscriptions and devices, after having been drawn in outline, and more or less tinted with colours, are backed up with silver or gold leaf, that is to say, the gold or silver leaf when viewed from the front of the glass plate constitutes the ground upon which the inscription or device is made. Gold and silver and other metals and alloys in the form of leaf or foil are generally employed for this purpose. This invention consists in applying gold, silver, or other metallic paper in place of the metal leaf.

STEANE, S. E. *The application of perfumery to articles of domestic use, such as candles, starch, washing-blue, lamp-oil, and such like articles.* Application dated July 24, 1855. (No. 1679.)

This invention consists in impregnating or mixing with the articles named in the title perfumes, such as orris root, camphor, musk, sandalwood, lavender, &c., or essential oils, gums, or spice, that throw out a perfume, varying the same as may be preferred.

GOODYEAR, C. *Improvements in the manufacture of carriages and other vehicles.*

Application dated July 24, 1855. (No. 1686.)

This invention consists in combining or cementing sheets and parts of India rubber compounds into the form of the body of a carriage or other vehicle, before subjecting the same to heat.

POTIN, J. B. M., and A. G. N. LINGÉE. *An improved composition applicable to the coating of iron, wood, stone, metals, and other substances.* Application dated July 24, 1855. (No. 1687.)

This composition, which is called "volcanic cement," consists of 25 parts of oil, and 75 of pulverised sulphur.

TUCKER, E. S. *An improved busk and hook for stays.* Application dated July 25, 1855. (No. 1688.)

It is a common practice to sew a large hook on to stays in front of the busk for the purpose of keeping various articles of ladies dress down at the waist, and from the strain upon the hook it is liable to tear out. Now this invention consists in making a suitable aperture or slot in the busk, and in shaping a hook in such manner at the back of the head as to fit into, and be firmly retained in the required position in the busk. A hole must be made in the stay covering to allow of the hook passing through it.

GIRARD, J. *Improvements in generating and applying steam to rotary engines of an improved construction.* Application dated July 25, 1855. (No. 1689.)

This invention, which has reference principally to an improved construction of steam boiler, consists in an arrangement of the interior spaces or flues by which the heating surfaces are to be increased, and greater strength and durability to be obtained. In the construction of the flues, plates of tinned metal are employed in such manner that the hot gases from the furnace and the water respectively fill the alternate spaces between them.

HALL, T. M. *Improvements in the construction of chimneys, more particularly applicable to the chimneys and funnels of locomotive and marine engines.* Application dated July 26, 1855. (No. 1694.)

These improvements consist in fitting a moveable or rotatory top to the chimney or funnel, such top being cut obliquely at a considerable angle, the highest part being always kept on the side next the wind or draught by an ordinary vane.

GEDGE, J. *Improvements in pumps.* (A communication.) Application dated July 26, 1855. (No. 1696.)

The inventor makes the body of the pump, and both the upper and lower boxes, of one piece in cast iron. Above and below these boxes are to be placed receivers or bottles which communicate with the suction and ascension pipes, &c.

PROVISIONAL PROTECTIONS.

Dated January 17, 1856.

126. Samuel Ratcliffe Carrington, of Stockport, Chester, hat manufacturer. Certain improvements in the manufacture of hats, and in machinery or apparatus connected therewith.

Dated February 1, 1855.

271. Allan Macpherson, of Brussels, Belgium, gentleman. Improvements in obtaining and applying motive power. A communication.

273. Edward Schischkar, of Halifax, York, manufacturer. Improvements in dyeing and colouring wools, hairs, silks, yarns, and textile fabrics made of the same materials either wholly or partially.

275. George Holcroft, Joseph Smith, and Thomas Holcroft, of Manchester, engineers. Improvements in machinery for preparing, spinning, and doubling cotton and other fibrous materials.

279. Andrew Lamb, of Southampton, Hants, engineer, and John Ronalds, of the same place, shipbuilder and naval architect. An improvement in the construction of iron ships, boats, and other similar structures.

281. Henry Bestwick, of Manchester, Lancaster, brassfounder, and Joseph Bury, of the same place, brassfounder. Certain improvements in cocks, taps, or valves.

283. James Timmins Chance, of Birmingham. Improvements in furnaces used for flattening glass.

285. Auguste Eugène Dannequin, of Rue de l'Echiquier, Paris, tailor. Certain improvements in caoutchouc or any other waterproof garments.

287. Benjamin Franklin Miller, of New York, United States. Improvements in ventilators for chimneys and other purposes.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," February 26th, 1856.)

2288. James Septimus Cockings and Ferdinand Potts. Certain improvements in sockets for holding whips and candles, parts of which are also applicable to the sockets or irons for holding carriage and other lamps.

2303. Samuel Kent. Improvements in purifying and measuring water, parts of which are applicable to measuring other fluids.

2310. William Church. An improvement or improvements in the manufacture of ordnance.

2314. Theodore Augustin Claeys. Improvements in the manufacture of corks and bungs.

2318. Jules Hyppolite Clément. An improved break for railway carriages, parts of which are applicable to breaks for other purposes.

2330. Thomas Taylor. Improvements in apparatus for extinguishing fire by means of water, part of which is also applicable to governing the discharge of fluids for other purposes.

2331. John Adcock. Improved apparatus for measuring and indicating the distance travelled by ships or other vessels.

2335. Charles Edwin Jones. Certain improvements in machinery for raising water and other liquids by means of a combination of the principle of the accumulation of force by compression of air or other elastic fluids and that of centrifugal force, the more readily to obtain increased mechanical power thereby.

2340. John Davie Morries Stirling. Improvements in coating silver, copper, zinc, and iron, and alloys of those metals.
2344. William Smith. Improvements in sewing machines. A communication.
2350. Thomas Craven and Matthew Pickles. Improvements in weaving.
2352. Pierre Antoine Henry Parant. Improvements in manufacturing millstones.
2354. Thomas Valentine and Daniel Foster. Improvements in power looms.
2378. John Healey, John Foster, and John Lewe. Improvements in machinery to be used for drawing, moulding, forming, and forging various articles of metal.
2397. Edward Stark. Improvements in pens for writing.
2426. Thomas Webster Rammell. Improvements in preparing black lead, chalk, and other materials used for drawing, writing, and marking.
2552. Julius Homan. Improvements in machinery for cutting up woven and other fabrics.
2641. Augustus Dacre Lacy. Machinery or apparatus for agricultural purposes to be used in combination with stationary steam power.
2642. John Pursloe Fisher. Certain improvements in the construction of the hammers of pianofortes.
2703. Auguste Dusautoy. New and useful machinery for cutting cloth and other substances.
2734. William Nunn. An improved table, wash-stand, mirror, &c., combined in one piece of furniture.
2795. John Horsley. Certain means of treating quinine and iodine, and other mineral medicines, in order to cause them to combine with cod-liver oil, or any other fish oil, or with seed oil.
2797. John Henry Johnson. An improved apparatus for discovering the leakage or escape of gas. A communication.
2851. William Sangster. Improvements in the manufacture of stays and corsets.
38. George Tomlinson Bousfield. Improvements in the manufacture of Jacquard piled or terry fabrics when parti-coloured yarns are used. A communication.
80. Jane Ann Herbert. An improved method of extracting the dirt, or the gum, or the colouring matter, or the principle from various vegetable or animal substances or materials. A communication.
90. Emile Constantin Fritz Sautelet. An improved process of tanning.
114. William Prangley. A novel instrument for exercising the third finger, and thereby facilitating the playing upon musical instruments.
119. John Hamilton, jun. Improvements in constructing the permanent ways of railways.
186. Louis Antoine Romain Richoux. Improvements in clock-works.
193. George Brooks Pettit and Henry Fly Smith. Improvements in gas-heating apparatus.
236. Daniel Foxwell. Improvements in sewing-machines.
237. William Henry Lancaster and James Smith. Improved arrangements for the application of gas and atmospheric air to the generation of heat in furnace or other flues, and the consumption of smoke.
243. Samuel Palmer Gladstone. Improvements in the construction of masts and yards.
265. Henry Render. A new or improved lubricating material.
268. John Barker Anderson. Improvements in the manufacture of soap, parts of which improvements are applicable to preparing materials for the purposes of illumination, and also for the purposes of lubrication.
273. Edward Schischkar. Improvements in dyeing and colouring wools, hairs, silks, yarns, and textile fabrics made of the same materials, either wholly or partially.
288. John O'Meara Beamish. An improvement in the manufacture of morocco leather.
306. Thomas Mills. Improvements in machinery for the manufacture of looped fabrics.
312. Francis Montgomery Jennings. Improvements in bleaching vegetable fibres.
326. Franklin Prestage. Improvements in locomotive engines.
345. John Wallace Duncan. Improvements in or connected with apparatus for the generation and application of steam for impelling purposes.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

434. Charles Nightingale.
438. Samuel Rodgers Samuels and Robert Sands.
445. Thomas Bell and Richard Chrimes.
456. Edwin Stanley Brookes, Joseph Black, George Stevenson and William Jones.
467. William Johnson.
469. Thomas De La Rue.
482. John George Taylor.
491. The Honourable James Sinclair.
677. George Ross.

LIST OF SEALED PATENTS.

Sealed February 15, 1856.

2880. Dundas Smith Porteous.

Sealed February 19, 1856.

1891. John Cornes.
1893. James Orange.
1895. Edward Field.
1898. Charles Van den Bergh.
1906. Charles Claus.
1911. William Lynall Thomas.
1922. John Avery.
1924. John Avery.
1928. Charles Frederick Stansbury.
1930. Adam Hall Hardy and Jacob Hardy Fordoff.
1993. George Hearnden Golding.
1994. George Hearnden Golding and Thomas Paine.
2004. Augustin Morel.
2100. Auguste Edouard Loradoux Bellford.
2204. William Ramscar.
2442. Auguste Edouard Loradoux Bellford.
2656. Denis Jonquet.
2830. William Henry Newman.

Sealed February 22, 1856.

1901. Jacob J. Lownds.
1903. Jules Theodore Alexandre Zinkernagel.
1905. Wright Jones.
1915. William Wood.
1923. John Avery.
1925. John Avery.
1927. Charles Frederick Stansbury.
1929. Eugene Carless.
1945. Auguste Edouard Loradoux Bellford.
1961. John Juckes.
2043. Eugène Grenet, jun.
2047. Edmund Sharpe.
2073. Jean Pierre Garbai.
2091. John Gray.
2171. Joseph Mitchell.
2189. Franz Uchatius.
2593. Joseph Denton.
2637. Charles Tennant Dunlop.
2697. Alfred Vincent Newton.
2753. Rudolph Bodmer.
2775. William Norton.

NOTICES TO CORRESPONDENTS.

B. Cheverton and *D. Mushet.*—We have not space for your communications in this number.

J. Clare.—Your pamphlet is received.

NOTICE TO FOREIGN SUBSCRIBERS.

We regret to find that, in consequence of a change in the regulations of the foreign post of this country, many of our subscribers did not duly receive the two last numbers of the Magazine. On learning this, we immediately despatched duplicate copies, amply pre-paid, to all such subscribers. We have subsequently had the necessary changes made in the Magazine, in order that it may pass through the foreign posts as a registered newspaper, and henceforth it will, we hope, be transmitted without fail.

CONTENTS OF THIS NUMBER.

Chattaway's Patent Railway Buffing and Coupling Apparatus—(*with engravings*) 193
Faraday's Experimental Researches in Electricity—(*continued from page* 157) 194
Perpetual Motion 199
The Naval Steam Power of Great Britain 201
Trapp's Improvements in Connecting and Disconnecting Shafts—(*with engravings*) 202
Sadleir's Improved Apparatus for Heating Liquids—(*with an engraving*) 203
Hall's Improvements in the Manufacture of Gunpowder 204
Hanson's Machine for Digging Potatoes 204
New Method of Generating Steam 205
Truran's Improvements in Blast Furnaces 205
Watson's Improvements in the Manufacture of Coke 205
Special Museums for the Working Classes 206
Examinations of the Members of Mechanics' Institutes, &c. 206
The Smoke Question 206

Specifications of Patents recently Filed:—

Bosse .... Drying Substances 208
Burdess .... Oil-cans 208
Thurgar .... Preserving Eggs 208
Johnson .... Reeds 208
Isoard .... Boilers 208
Stocker .... Water-closets 208
Cunningham .... Reefing Sails 208
Johnson .... Motive Power 208
Conner .... Brushes 209
Deschamps & Vilcoq .... Diving-boat 209
Striby .... Musical Notation 209
Fontainemoreau .... Voltaic Batteries 209
Tooth .... Salting Flesh 209
Myers .... Railway-buffers 209
Pittar .... Bridges 209
Wren .... Perambulators 209
Hepplewhite .... Spare Rudders 209
Kelk .... Paper 209
Ripley .... Woven Fabrics 209
Achard .... Motive Power 210
Rollet .... Projectiles 210
Ritterbandt and Bower .... Manure 210
Westwood and Baillie .... Preserving Timber 210
Stent .... Wet Gas Meters 210
Wood .... Ink 210
Johnson .... Fire-arms 210
Johnson .... Fire-arms 210
Brooman .... Pipes and Tubes 211
Petitjean .... Silvering Glass 211
Hewitt .... Pumps 211
Huthnance .... Drying 211
Bailey .... Knitted Fabrics 211
Bousfield .... Cutting Wood 211
Scully & Heywood .... Inkstands 211
Weallens & Crow .... Steam Engines 212
Davies .... Boiler 212
Schiele .... Motive Power 212
Beattie .... Mattresses 212
Poncelin .... Coffee 212

Provisional Specifications not Proceeded with:

White .... Swinging Beds 212
Johnson .... Axles 212
Moll .... Paper 212
Féau-Lefebvre .... Motive Power 212
Perry .... Cases for Food 212
McLaren & Pugh .... Artificial Fuel 212
Goodyear .... Printing Surfaces 213
Dugdale .... Locomotives 213
Kenworthy and Greenwood .... Screw Propellers 213
Goodyear .... Wheels 213
Goodyear .... Moulded Articles 213
Goodyear .... Bands or Straps 213
Goodyear .... Combs 213
Goodyear .... Boats 213
Craig .... Consuming Smoke 213
Bradley .... Reaping Machines 213
Twist .... Ornamenting Glass 213
Steane .... Perfumery 213
Goodyear .... Carriages 213
Potin and Lingée .... Coating Substances 214
Tucker .... Hook for Stays 214
Girard .... Steam Boilers 214
Hall .... Chimneys 214
Gedge .... Pumps 214

Provisional Protections 214
Notices of Intention to Proceed 214
Patents on which the Third Year's Stamp-Duty has been Paid 215
List of Sealed Patents 215
Notices to Correspondents 216
Notice to Foreign Subscribers 216

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1700.] SATURDAY, MARCH 8, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

CUNNINGHAM'S PATENT IMPROVEMENTS IN REEFING SAILS.

Fig. 1.

Fig. 2.

Fig. 5.

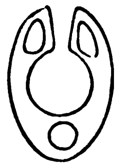


Fig. 6.

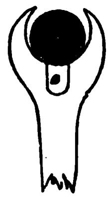


Fig. 3.

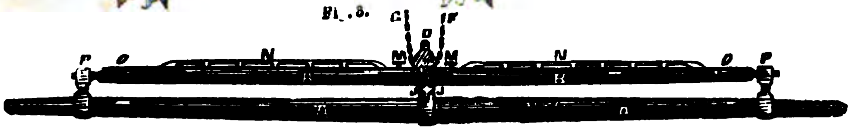


Fig. 4.

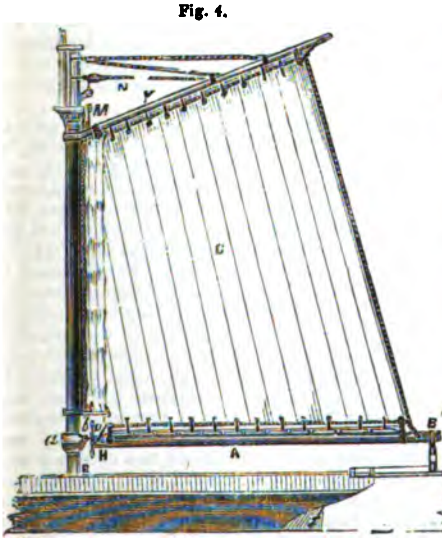
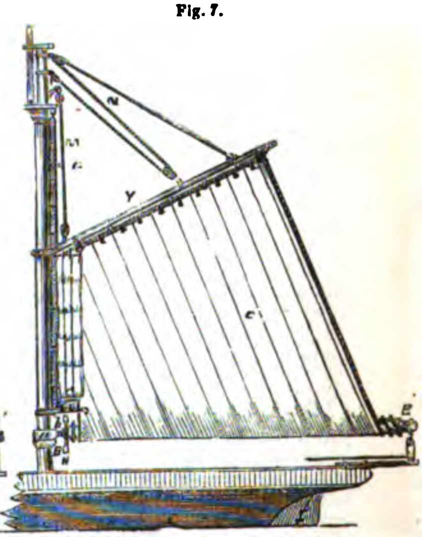


Fig. 7.



CUNNINGHAM'S PATENT IMPROVEMENTS IN REEFING SAILS.

In 1850, Mr. H. D. P. Cunningham, R.N., obtained a patent for a method of reefing the square sails of ships by rolling them upon revolving yards, and for a method of imparting rotary motion to the yards, partially by means of the weight of the yard and its attachments. This invention was described at length at page 441 of our fifty-seventh volume (No. 1530), where it was also spoken of with entire approbation. We have subsequently become acquainted with numerous instances in which it has been employed with very great advantage. A few days since, for example, while making a short journey by train, we casually heard the master of a ship assert that he recently saw a vessel, with which his own was in company, and which was fitted with Mr. Cunningam's improvements, shorten sail and change her course with so much facility, that she altogether and easily avoided dangers from which he himself escaped with extreme difficulty, and that only with a delay of nearly eight-and-forty hours. The rapidity and ease with which the vessel in company was worked arose entirely from the facilities afforded by the improved reefing arrangements.

We have now to lay before our readers certain improvements which have recently been made by Mr. Cunningham upon his previous plans.

He now uses a double yard, or two yards connected with each other, one being made to revolve round, and the other fixed upon its axis, and upon or from the revolving yard or roller he rolls the sail up and off. He imparts rotation to the revolving yard by the several methods described in the specification of his former patent, that is, by the action of hoisting upon or slacking the chain tye or haulyards passed under the yard, and working in an indented grooved boss fixed on the yard, such indented groove being intended to prevent the chain slipping or rendering round the said yards; in other words, to prevent the yard from turning round in the bight of the chain, except when acted upon by hoisting or lowering upon one part thereof, or by the application of a band or bands or rope or ropes wound round the revolving yard, one end of which is to be confined to the yard, and the unrolling or unwinding of which when acted upon is to produce rotation in the revolving yard. Or he imparts rotation to the revolving yard by applying thereon a cogged boss or ring, and by leading the chain tye or haulyards through a block secured to the yard which does not revolve, or to the iron-work on the revolving yard (which iron-work does not revolve), the sheave in this block being indented in the same manner as described in the former specification with reference to the boss. The pin or axis of the sheave is to be a fixture to the sheave, that is to say, the sheave will carry the pin round with it when revolving, instead of revolving on the pin as in an ordinary block; the sides of the block or pulley being suitably constructed for the purpose. He also proposes to elongate the axis or pin so that it may protrude to a suitable distance from the side of the block or pulley, the part so protruding being screw-threaded so as to form an endless screw. The block or pulley is so fixed with reference to the cogged boss or ring that the endless screw takes into the cogs thereon so that when the sheave in the block is turned round by hauling or lowering on the chain, rotation will be imparted to the revolving yard, and thereby the sail will be rolled upon or unrolled from the yard. There are many other mechanical arrangements by which rotation may be produced.

We have thus far referred to those yards which hoist up or lower down when the sails are reefed or unreefed, and in which the weight of the yard and attachment acts as an important auxiliary in producing rotation; but in the case of lower or standing yards, the rotation of the yard is produced by drawing the chain over or along the indented grooved boss or sheave by suitable purchases, or by drawing off or unrolling the bands or ropes fixed to the yard. He also proposes to turn lower yards round by means of a winch worked aloft and upon the spindle of which a cogged wheel communicates with a cogged wheel fixed on the yard; a superior purchase is thus obtained for heavy lower yards. For enabling the sail to clear the centre fittings on the rotating yard, he employs the same arrangements as those described in the specification before mentioned, but with the following improvements; viz., instead of sewing the rope on to the edges or sides of the division in the sail, in the manner known by sailmakers by the term "roping," he puts the rope inside the tabling of the canvas, and stitches the two parts of the canvas firmly together and tightly against the rope, thus leaving a raised edge to the canvas, upon which the travellers will slide more freely than on the ordinary roping. He also forms this raised edge by preparing the canvas with a coating of solution of India-rubber, and the canvas being made to overlap the rope, he unites the two parts by pressure, the India-rubber being subjected to a certain process to enable it to resist the effects of differences of temperature. Instead of carrying the sides of the division straight down, he makes the bottom of the division narrower than the top, in order to relieve the raised edging from strain. Instead of leading the top gallant sheets above the yard through blocks fixed to the upper part of the yard arm iron as before, he

leads the sheet of the sail above through sheave holes in the unrevolving yard, or through blocks or checks fixed thereto or in connection therewith, such blocks being fitted with swivels to turn round so as to adjust themselves to the direction of the sheet. He also applies the plan of rolling up sails to reef them, and *vice versâ*, to all the square sails of ships, and proposes to carry down the division in the sails to such a depth, if required, as to roll the sails up almost entirely. He rolls up or unrolls the boom or gaff sails of ships or vessels by causing the boom to revolve for that purpose.

Fig. 1 of the engravings on page 217, represents, in section, the two yards before alluded to, with the chain tye or haulyard leading under the revolving yard, and through sheave holes in the mast, and fitted to a topmast. B is a section of the revolving yard, upon which is fixed a whelped boss, embraced on each side by the hoops, G, and attached to the iron work on the fixed yard, A, of which H represents the hoop. C is the parrall sliding up and down the mast, to which the yard, A, is shown attached. It is not, however, necessary that the fixed or revolving yard only or always shall be attached to the parrall. It may be convenient to attach the yard, B, to the parrall, and to have an attachment by rope from the yard, A, to the mast. In the figure the unrevolving yard is also represented much larger than the revolving yard; this is not absolutely necessary. The revolving yard may be the same size, or larger, than the unrevolving yard. E and D are the ends of the haulyard, the end, D, by being hauled upon or slackened (the end, E, being kept fast), conveys rotation to the revolving yard, as described in the specification of the former patent.

Fig. 2 represents the mode of conveying rotation to the revolving yard by means of the axis of a block or pulley (the sheave of which is whelped or indented to receive the links of the chain haulyards or tye.) This axis is elongated, and protrudes beyond the side of the block, and is wormed or formed into a screw, which is made to work into the teeth of a cogged wheel or hoop attached to the revolving yard, B. This yard is properly fitted in the centre, and attached to the fixed yard, A. D is an end view of the block, with the whelped pulley; E its elongated axis; J J, are the teeth on the cogged wheel attached to the yard, B; F G is the chain, tye, or haulyard, passing through blocks on each side the mast, as at H, and through the block, D. If the end of this chain, say at G, be kept fast, and the other end, F, be pulled upon, rotation will be conveyed to the revolving yard, B, by the wormed axis, E, operating on the cogged wheel, J, as before explained.

Fig. 3 is a front view of the two yards. B B is the revolving yard secured to the fixed yard, A A, at the points, P P and J J, and so fitted as to turn round freely at and in the several points of attachment; N N are the jacstays for securing the sail to the yard; M M are bolts for securing the inner parts of the sail to; O O are holes through which the rope (head earring) is rove, for securing the outer part of the sail. G and F represent the chain before described.

In the engravings the revolving, or indeed both the yards, are represented as formed of an entire spar. But the middle part of the yards, and especially that of the revolving yard, might be made with great advantage of tubular iron; that is, formed of an iron tube, upon which the whelped boss and other attachments could be fixed, and into which the wooden sides or outer ends of the yards might be inserted and securely confined.

In fig. 4 A A represents a boom fitted to revolve. It is connected to the mast at B, through the collar, *a*, and pin, *b*, while its outer end, B′, is free to revolve in a collar, *c*, held by the main sheet. C is the sail, the fore part or luff of which is fitted with one of the patent bonnets or aprons, as before described. The fore part of the sail is formed with a raised edge. Travellers (see fig. 5), which are connected with other travellers working on a slip of canvas with a raised edge attached to the mast (see G fig. 7), work up and down the raised edge on the sail. The bonnet is attached to these travellers. The sail is attached to the boom by earrings at the ends, and also to a jackstay. The end of the boom at B is fitted with handles, H, by which it is to be turned round. When required to reef the sail, the peak and throat haulyards, M N, are lowered, upon which the gaff, Y, lowers, and the handles, H, and boom being turned round, the sail is rolled up round the boom, as shown at fig. 7. The arrangement of the bonnet on the fore part of the sail provides for its attachment to the mast, and at the same time enables it to be rolled round the boom, *e*. Fig. 6 shows the seam or hollow cut in the jaws of the gaff, to clear the strip of canvas with the raised edge. The reverse operations to those described will shake or let out the reef. A purchase may be applied to cause the rotation of the boom, as well as or in place of the handles. It is not absolutely necessary to have the bonnet. The fore part of the sail may be brought up to the mast and laced to it. The lacing, of course, must be unlaced as its rolls up.

PERPETUAL MOTION.

(Concluded from p. 201.)

M. Seguin, in 1839, controverted the position that derived power could be got by the mere transfer of heat, and by calculation from certain known data, such as the law of Mariotte, viz., that the elastic force of gases and vapours increased directly with the pressure; and assuming that for vapour between 100° and 150° centigrade each degree of elevation of temperature was produced by a thermal unit, he deduced the equivalent of mechanical work capable of being performed by a given decrement of heat; and thus concluded that for ordinary pressures about one gramme of water losing one degree centigrade would produce a force capable of raising a weight of 500 grammes through a space of one metre; this estimate is a little beyond that given by the more recent experiments of Mr. Joule. M. Seguin has, however, since the accurate and elaborate experiments of M. Regnault necessarily varied his estimate, as by these experiments it appears that, within certain limits, for elevating the temperature of compressed vapour by one degree, no more than about $\frac{3}{10}$ths of a degree of total heat is required; consequently, the equivalent multiplied in this ratio would be 1666 grammes, instead of 500. Other investigators have given numbers more or less discordant, so that without giving any opinion on their different results, this question may be considered at present far from settled. M. Regnault himself does not give the law by which the ratio of heat varies with reference to the pressure, and is still believed to be engaged in researches on the subject, one involving questions of which experiments on the mechanical effects of elastic fluids seem to offer the most promising means of solution.

One of the greatest difficulties which had presented itself to Mr. Grove's mind, with reference to the theory of Carnot, had been one of analogy, derived from the received theories of electricity. Many electrical cases might be cited in which no electricity is supposed to be lost, though a certain mechanical effect is produced by the electricity; if, for instance, a ball vibrates between a positively and negatively electrified substance, none of our electrical theories lead us to believe that any difference in the actual amount of electricity transferred would be occasioned by the ball being attached to a lever which would strike a wheel or produce any other mechanical effect.

In preparing this evening's communication an experiment had occurred to him, which, though performed with imperfect apparatus and therefore requiring verification, does, as far as it goes, support the view derived from the negation of perpetual motion, viz., that when electricity performs any mechanical work which does not return to the machine, electrical power is lost. The experiment is made in the following manner: A Leyden jar of one square foot coated surface has its interior connected with a Cuthbertson's electrometer, between which and the outer coating of the jar are a pair of discharging balls fixed at a certain distance (about ½ an inch apart). Between the Leyden jar and the prime conductor is inserted a small unit jar of nine square inches surface, the knobs of which are 0·2 inch apart.

The balance of the electrometer is now fixed by a stiff wire inserted between the attracting knobs, and the Leyden jar charged by discharges from the unit jar. After a certain number of these (22 in the experiment performed in the theatre on this occasion), the discharge of the large jar takes place across the ½-inch interval; this may be viewed as the expression of electrical power received from the unit jar. The experiment is now repeated, the wire between the balls having been removed, and therefore the "tip" or the raising of the weight, is performed by the electrical repulsion and attraction of the two pairs of balls; at 22 discharges of the unit jar the balance is subverted, and one knob drops upon the other, but *no discharge takes place*, showing that some electricity has been lost, or converted into the mechanical power which raises the balance. By another mode of expression the electricity may be supposed to be masked or analogous to latent heat, and would be restored if the ball were brought back, without discharge, by extraneous force.

This experiment has succeeded in so large an average of cases, and so responds to theory, that notwithstanding the imperfection of the apparatus, Mr. Grove places much reliance on it; indeed it is difficult to see, if the discharges or other electrical effects were the same in both cases, why the raising the ball, being extra and the ball being capable by its fall of producing electricity or other force, force would not thus be got out of nothing, or perpetual motion attained.

The experiment is believed to be new, and to be suggestive of others of a similar character, which may be indefinitely varied. Thus, two balls made to diverge by electricity should not give to an electrometer the same amount of electricity as if they were, whilst electrified, kept forcibly together, an experiment which may be tried by Coulomb's torsion balance.

There is an advantage in electrical expe-

riments of this class, as compared with those on heat, viz., that though there is no perfect insulation for electricity, yet our means of insulation are immeasurably superior to any attainable for heat.

Similar reasoning might be applied to other forces; and many cases, bearing on this subject, have been considered by Mr. Grove in his essay on the "Correlation of Physical Forces."

Certain objections to these views were then discussed, and especially some apparently formidable ones presented by M. Matteucci in a paper published by him some time ago.*

This distinguished philosopher cites the fact, that a voltaic battery decomposing water in a voltameter, while the same current is employed at the same time to make an electro-magnet, nevertheless gives in the voltameter an equivalent of gas, or decomposed substance, for each equivalent of chemical decomposition in the cells, and will give the same ratios if the electro-magnet be removed. In answer to this objection it may be said, that in the circumstances under which this experiment is ordinarily performed, several cells of the battery are used, and so there is a far greater amount of force generated in the cells than is indicated by the effect in the voltameter. If, moreover, the magnet is not interposed, still the magnetic force is equally existent through the whole circuit; for instance, the wires joining the plates will attract iron filings, deflect magnetic needles, &c. By the iron core a small portion of the force is absorbed while it is being made a magnet, but this ceases to be absorbed when the magnet is made; this is proved by the recent observations of Mr. Latimer Clarke, which were fully entered into and extended by Mr. Faraday, in a lecture at the Institution (Jan. 20, 1854).† It is like the case of a pulley-and-weight, which latter exhausts force while it is being raised, but when raised the force is free, and may be used for other purposes.

If a battery of one cell, just capable of decomposing water and no more, be employed, this will cease to decompose while making a magnet. There must, in every case, be preponderating chemical affinity in the battery cells, either by the nature of its elements or by the reduplication of series, to effect decomposition in the voltameter; and if the point is just reached at which this is effected, and the power is then reduced by any resistance, decomposition ceases. Were it otherwise, were the decomposition in the voltameter the exponent of the entire force of the generating cells, and these could independently produce magnetic force, this latter force would be got from nothing, and perpetual motion be obtained.

In another case, cited by M. Matteucci, viz., that a piece of zinc dissolved in dilute sulphuric acid gives somewhat less heat than when the zinc has a wire of platinum attached to it, and is dissolved by the same quantity of acid, the argument is deduced, that as there is more electricity in the second than in the first case, there should be less heat; but, as according to our received theories, the heat is a product of the electric current, and in consequence of the impurity of zinc, electricity is generated in the first case molecularly in what is called local action, though not thrown into a general direction, there should be more of both heat and electricity in the second than in the first case, as the heat and electricity due to the voltaic combination of zinc and platinum are added to that excited on the surface of the zinc, and the zinc should be, as in fact it is, more rapidly dissolved. Other instances are given by M. Matteucci, and many additional cases of a similar description might be suggested. But although it is difficult, perhaps impossible, to restrict the action of any one force to the production of one other force, and one only, yet if the whole of one force, say chemical action, be supposed to be employed in producing its full equivalent of another force, say heat, then as this heat is capable in its turn of reproducing chemical action, and, in the limit, a quantity equal or at least only infinitely short of the initial force; if this could at the same time produce independently another force, say magnetism, we could, by adding this to the total heat, get more than the original chemical action, and thus create force or obtain perpetual motion.

The impossibility of perpetual motion thus becomes a valuable test of the approach that in any experiment we may have made to eliminating the whole power which a given natural force is capable of producing; it also serves, when any new natural phenomenon is discovered, to enable us to ascertain how far this can be brought into relation with those previously known. Thus when Moser discovered that dissimilar metals would impress each other respectively with a faint image of their superficial inequalities,—that, for instance, a copper coin placed on a polished silver plate, even in the dark, would, after a short time, leave on the silver plate an impression of its own device, it occurred to Mr. Grove that as this experiment showed a physical radiation taking place between the metals, it would afford a reason for the effects pro-

* Archives des Sciences Physiques, vol. iv., p. 380.

† Proceedings of the Royal Institution, vol. i., p. 345.

duced in Volta's contact experiment, without supposing a force without consumption or change in the matter evolving it. This led him to try the effect of closely approximating discs of zinc and copper without bringing them into metallic contact; and it was found that discs thus approximated, and then quickly separated, affected the electroscope just as though they had been brought into contact. Without giving any opinion as to what may be the nature of the radiation in Moser's phenomena, this experiment removes the difficulty presented by that of Volta to the chemical theory of electricity.

The present scope of the argument from the negation of perpetual motion leads the mind to regard the so-called imponderables as modes of motion, and not as different kinds or species of matter. The recent progress of science is continually tending to get rid of the hypotheses of fluids, of occult qualities, or latent entities, which might have been necessary in an earlier stage of scientific inquiry, and from which it is now extremely difficult to emancipate the mind; but if we can, as it is to be hoped we shall ultimately arrive at a general dynamic theory, by which the known laws of motion of masses can be applied to molecules, or the minute structural parts of matter, it seems scarcely conceivable that the mind of man can further simplify the means of comprehending natural phenomena.

CONSTRUCTION AND PROPULSION OF VESSELS.

MR. W. BRIDGES ADAMS'S METHOD OF WELDING THE SHEETS OF IRON SHIPS, ETC.

In February, 1852, there appeared in the *Practical Mechanics' Journal*, an article by Mr. W. Bridges Adams, entitled "Surplus Engineering Labour." It was on the occasion of the engineering strike. In discussing the question, the future progress of engineering was dwelt on, the possible disappearance of the exotic cotton manufacture, and the advent of iron shipbuilding on a scale never before contemplated, and by means which were pointed out. We quote from the article as follows:

"We see as yet but the beginning of ocean locomotion. We wait for the chemists who are in arrear of travelling mechanism, even as they are in advance of the mechanism of food cultivation. In casting away timber, the ship material of our youth, provided by nature for one period of our progress, a material which limited us to size, we enter upon the uses of iron, the limit of whose properties we as yet know not. Many of its qualities we have worked out. We can hermetically coat it and stop rust. We can *rivet* it into air-tight cells and forbid it to sink. We can defy fire penetrating beyond the limits we assign to it. We can make icy caverns in its cells, and maintain polar cold, and we can keep up blast furnaces in its entrails to serve as lungs to confer on it life and power of locomotion. But as yet we have not got to our limits in form, proportion, and size. Our iron forges are as yet toys, and must change their location. The dwarfish workshops of the hills must give place to the giants of the ocean border; for the proportions needed are no longer capable of land transit. As the whale is to the racehorse, so is the ocean steamer to the land locomotive. It is size that gives speed in the water, that makes the largest of the sea waves seem but as ripples of the pond; and to obtain size in the ship, it is essential that the parts composing it be of great size also—that the iron ribs and iron planking be proportional to the whole. Pigs of iron may be transported in any number from the river to the water side, and may then be aggregated to the requisite form and proportion at the smallest expenditure of fuel and labour. The heat that makes the iron malleable may help to forge it to its shape, may help to put it into the structure of which it is to form a part. The fewer the number of pieces in the vessel the stronger it would be. Could the vessel be soundly forged in one mass, without joint or seam, it would be still better, and all that approximates to this is a gain. Till the tools and machinery for these purposes shall be erected at the water's edge, we cannot construct the vessels we need, thoroughly to master the ocean and tame it to the purposes of man, to make it a smooth highway whereon men may travel as safely and as commodiously as on land. For if we can attain the size to smooth the waves of the ocean, we are sure of corresponding increased speed and the absence of sickness; we can be safe from fire, safe from wreck, safe from famine and the tortures of thirst."

There are here two ideas prominent; first, the making vessels of what we call enormous size, an idea more than once put forth by Mr. Adams, before writing the paper we quote from; and secondly, forging instead of riveting the iron vessel together. The idea was clear, though the practical method was not described, and, for the apparent reason, that Mr. Adams contemplated a patent for that and other improvements, which we now proceed to give an account of.*

* Patent dated May 12, 1855. (No. 1072.)

The patent sets forth the desirability of constructing our vessels, with two shells or plankings, an inner and outer, for the sake of security against damage, by striking rocks or otherwise, and going down plumb, as did the Tayleur, and as others have done, and will continue to do, on the ordinary mode of construction. The shells are connected together, not in the cellular riveted mode, adopted in Mr. Russel's vessel, but by stay bolts at intervals of three to four feet, forming distance pieces to keep the shells at the proper distance apart and secure them, just as the fireboxes of locomotive engines are formed, probably the strongest structure known for resisting strains. The shells being thus fixed together, are filled with melted bitumen or similar substance (mixed or not with other materials) up to the requisite height above the water line. Thus a structure of great strength will be obtained, and rust will be prevented by the adhesion of the heated bitumen, which, adhering also to the stay-bolt, will present throughout a very powerful, and yet elastic, general stay to the structure, while the expense will be materially lessened, in respect both to the material, and to the quantity of iron employed.

These shells may be put together by riveting at the joints and afterwards welding or brazing the joints, but the preferred method is to weld them solidly by a novel process. Before describing it we will generally state the principles which must govern all sound welding.

If a mass of puddled iron, with the cinder quite taken out, be thoroughly hammered into a bloom and then rolled out, it will probably be found homogeneous—that is, free from specks or cracks; but if two such blooms be heated in the furnace to a welding heat for the purpose of uniting them, and afterwards hammered and rolled together, it will be found that the union will be imperfect, and the joints in contact full of flaws and minute crevices. If we plane the surface of a piece of what is called "scrap iron," we shall find it full of minute flaws, resembling the grain of some kinds of wood. The philosophy of this is very clear. Iron heated to the condition of welding has a powerful attraction for oxygen. If a piece of iron thus heated be withdrawn from a furnace, it will instantly be covered with a scale, which is oxide of iron, and which shrinks, cracks, and falls off; when a second scale forms, and so on till the heat is lowered to the point where its affinity for oxygen is lessened. Now, if two pieces of iron intended to be welded together are withdrawn from a furnace, portions are scaled over; and if those scales are welded up, the connection becomes what is called a "cold shot;" that is, the scale of oxide of iron destroys the continuity of the weld, and the mass is not homogeneous, or only so in parts, precisely as dry flour interposed between a baker's rolls prevents adhesion. To prevent this oxide forming, smiths are accustomed, in small work, to sprinkle over the incandescent surfaces silicious sand, which melts into a glue and shuts out the oxygen, but is disadvantageous in other ways.

Reasoning thus, that the process of welding is simply a perfect contact of the surfaces of iron quite clean, and in the incandescent state, Mr. Adams purposes to use another plan of keeping the incandescent iron from oxydising. Every one knows that the wick of a candle surrounded by flame is not consumed, but that if it be projected beyond the wall of flame, it is immediately burnt away by the contact of the oxygen. In welding, Mr. Adams applies the same principle. A gasometer, with gas under a considerable and sufficient pressure, and a similar vessel with air under pressure, communicate by flexible or other tubes with two perforated pipes, pierced through their whole length with orifices nearly close together; with the due chemical mixture of the air and gas, a sheet of intense flame is thus induced, which is perfectly manageable, and may be directed exactly on the required surfaces without burning away the edges or other portions, and with this flame the access of the oxygen to the iron is perfectly cut off. The action of this elongated blow-pipe heat will be very rapid, and of course a stream of water may be made to move along the iron below the heated parts, to prevent the heat spreading. When the adjoining surfaces are to be welded, an opening must be left between them for the flame to play. When the incandescent condition is attained, pressure—hydrostatic pressure in preference—is applied, and the surfaces are homogeneously united without blows, scales, or dirt. In fact, such an operation could be performed in a drawing-room. Thus the whole of the iron vessel may be forged of one homogeneous piece, without either joint or seam. And it will be a great advantage, not attainable in any other mode, to have a practically inexhaustible supply of fuel in the gaseous form carried from a convenient spot by flexible tubes to heat any length of joint simultaneously, and prevent "buckling." This will obviate much difficulty in ship structure. The same process is applied to the forging of shafts, which are prepared in short cylinders, turned at the ends to salient and re-entrant cones, heated in the mode described, and pressed together in succession.

It is obvious that the success of the operation depends on preventing the scale of oxide from forming, and the rapid and simultaneous heating. With convenient tools the whole operation would be far more rapid and economical than any riveting can be; and there is another important consideration—a sheet of welded iron of half an inch in thickness will be stronger than three quarter inch iron riveted. In other words, there will be a saving of one-third the weight of metal. With equal thickness, the strength would be nearly duplicated. Mr. Adams applies a similar process for brazing the joints.*

The next part of Mr. Adams's improvements consists in constructing paddle wheels or propeller connections, so as to prevent what is technically called "back lash." The arrangement is by applying the force through the medium of India-rubber or other springs, which undergo a certain amount of compression before the force takes effect in moving the machinery; thus there is an absorption of such power as would otherwise induce percussion, which power is given out again, as required, and the springs thus form a kind of compensation balance. The effect of this must be greatly to prevent vibration in the vessel, and also to economise power and fuel.

Another improvement is, for the better lighting of vessels by night and in fogs. At present vessels are lighted by oil or candles, inclosed in glass, and not particularly remarkable at sea, which lights are apt to wax dim or go out, and have to be taken down to be replenished. Mr. Adams's method is to light by gas, prepared on the olefiant method by dropping oil or grease through a heated pipe passing through the furnace or through the galley fire. In this mode there will be no risk, as the gas is only generated in exact proportion to the consumption. As it forms in the pipe, it is carried up to the head of the chimney, and may there form a corolla of lambent flame, there issuing out on all sides, and will be as conspicuous in the distance as an iron-works or the flame of a volcano.

The last proposition is for a sound signal. Atmospheric air is compressed by the engine, into a reservoir, and discharged continuously through a gigantic trumpet, with an incessant or intermittent warning sound. Those who have been at sea well know how much more striking is the sound of a speaking trumpet than that of a bell.

* Bertram's patent specifies the application of portable forges to weld iron plates together. The inventor employs a kind of retort forge lined with fire clay, which is to be charged with fuel and closed with a luted door. The nozzle must, of course, be lined with fire-clay also, and the forge must be applied in close contact with the iron to be heated. Thus, the inside of the forge and the nozzle must be a glowing furnace. This arrangement cannot heat a long shut simultaneously, and if the fuel happens to be exhausted before the weld is complete, it seems probable that the welder will "come to grief" by "buckling," and other difficulties. Moreover the tackle, and railways, and smiths' hammers, and adjustments would certainly not simplify the matter. With gas and pressure, all becomes simple and noiseless, and capable of acting through any length of time.

PREVENTING EXPLOSIONS IN STEAM BOILERS.

We have received from Mr. Harshman, of Dayton, a pamphlet containing his views on the electrical development of heat, and the means of saving fuel, and preventing explosions in steam boilers. Mr. Harshman has been employed for several years in carrying on a series of experiments, having especial reference to the relations of the electrical condition of metals to the development of heat in steam boilers, and the means of reducing the danger of, or rather preventing explosions. We mention these facts to show that Mr. Harshman's theory is no new fledged thing thrown at random on the world at the instant of its conception. The facts in the matter have been patiently proved by experiment, and the theory adopted has been rather the result of the experiments, than the experiments the result of the theory. We therefore ask for this subject the attention that it deserves in respect to its own importance, and the manner in which it has been approached by the inventor. We would, however, be distinctly understood as neither advocating nor disparaging it. We shall give the theory in few words, and then detail an interesting experiment at which we were present.

Mr. Harshman's theory is, that water contains a large amount of latent heat, which, under some circumstances, is capable of being rapidly and dangerously developed, and under others of being gradually freed without danger, and that to accomplish this, it is necessary to establish an electric or galvanic equilibrium in the boiler. That an iron boiler, covered in all but its fire surface and flues, with a copper coating, generates steam very rapidly, saving half the fuel, and cannot be exploded. It may rupture by over-pressure, and relieve itself by allowing an escape of steam, but it cannot explode. This he has tested to his own satisfaction by single and comparative experiments, and has now set out to prove to others.

The first experiment was made a week ago to-day in this city. We were present in company with others, and were highly interested. The experimental boiler employed was a small cylinder without flues,

12 inches long and 8 inches in diameter. The cylinder was made of iron ·02 inches thick, and the ends somewhat thicker. The seams were riveted and soldered, and the safety valve fastened to the boiler by solder. The furnace was of common construction, without return flue. The boiler was placed in a strong frame of iron, the ends being confined, one by a bar extending across the end, and the other by a square piece of iron in the centre. One half the surface of the cylinder was exposed to the action of the fire, the other half was covered with copper. The ends were also covered with copper. The safety valve was confined by a long wire attached to a spring balance. The fuel employed, was hickory wood well dried. The boiler being placed in such position that its explosion could do no damage, the fire was lighted, and the observers withdrew to a distance to observe the pressure at the balance, and watch the operation of the experiment. In a few moments, steam had risen to a hundred, a hundred and fifty, and two hundred pounds, and in less than half an hour, the balance indicated a pressure of two hundred and sixty pounds. At this point, steam was observed to issue from underneath the copper sheeting. The safety valve was drawn tighter, and the fire continued for ten minutes, steam continuing to issue. The safety valve was then loosed and steam blown off, and the fire put out. On first examination, the boiler seemed only to have opened at the seam around the front head, and at the point where the safety valve was fastened; but subsequent careful inspection showed that the iron had opened in little fissures in several places which were perfectly tight under any ordinary pressure, but gave vent at the high pressure to which this experiment was carried. The ends of the boiler had bulged out to some extent, and the impression of the square nut at one end was left very distinctly crushed into the copper jacket. The day was clear and cold, with the wind blowing from the West.

This experiment was repeated on Saturday with the same result.

Now, according to all ordinary experience, the boiler should have burst with great force. Yet we are witnesses to the fact that it only ruptured and gave vent to the steam as easily as a safety valve usually relieves an ordinary boiler.—(*American*) *Railroad Record.*

MAWSON'S PORTABLE PHOTOGRAPHIC CAMERA.

Mr. J. Mawson, of Newcastle-upon-Tyne, has introduced an improved photographic camera, in which great portability and efficiency are combined. It is one of the lightest and most compact of the portable class, and not less convenient, or in other respects inferior to the more bulky. It is suitable for every climate, and it should be observed, that though very light, it is substantial, and likely to be extremely

Fig. 1.

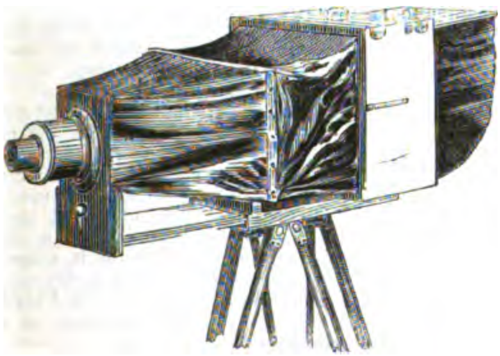
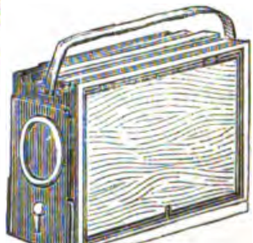


Fig. 2.



durable. The focus is obtained in the most convenient manner, by means of a screw, the head of which projects beneath the focussing tablet. The rigid brass tube which usually projects from the lens, has substituted for it a collapsable tube. It is available for the calotype, collodion, albumen, waxed paper, and other photographic processes, and may be fitted either with simple achromatic lenses for views, or compound lenses for portraits.

Fig. 1 of the accompanying engravings

shows the camera unfolded. The base consists of a slide and sheath. The slide bears a bracket, to which the lens is attached by means of a sliding front. The sheath carries the main frame, which is grooved, either for one or two dark chambers, and the focusing glass. The body is composed of strong leather-like cloth, both light-proof and water-proof. One end of the body is fixed to the main frame, and the other is connected with the lens by a conical tube of pliant cloth, the neck of which is elastic, and contracts over a collar behind the lens. The projection at the back of the instrument shows the focusing tablet, with a shutter for its protection, and a screen which supplies the place of the ordinary focusing cloth.

Fig. 2 represents the camera folded. Folding is effected by first detaching the cloth tube from the lens, and packing it with the body in the space between the dark chambers and focusing glass. The slide is then screwed in; and, when released from the detent in front, the main frame is turned square with the base.

HADDAN'S IMPROVEMENTS IN CANNON.

MR. J. C. HADDAN, of Westminster, has recently patented an invention which consists, firstly, in casting cannon hollow with any desired form of grooves or rifling, and with any desired amount of inclination or twist (whether such inclination be uniform or otherwise throughout the length of the cannon.) The manner in which this is performed is as follows:—A tubular or hollow metal core, which is formed externally of the shape intended to be given to the interior of the cannon, is provided with the means of keeping up a continual circulation or change of water within it, for the purpose of keeping the core cool, and giving a chilled surface to the interior of the cannon. Secondly, in manufacturing cannon by casting the mass, or greater portion of the metal of which they are composed, upon or around a permanent hollow mandril, or core, or lining (for the cannon) of comparatively thin substance, such mandril, core, or lining consisting either of one piece only, or of two or more pieces or sections, longitudinally or otherwise, and its interior being formed to the intended shape of the bore of the cannon, whether rifled or otherwise, either previously or subsequently to casting the mass into or around its exterior. The manner in which that is performed is as follows, the hollow mandril, or core, or lining, being called the tube: In order to insure a firm and solid fitting of the tube, so that the concussion of firing may be less likely to displace or loosen it within the cast-iron, its exterior is made with longitudinal corrugations, flutings, or flat surfaces, which, however, are considered to be unnecessary throughout the entire length, and therefore it is preferred to turn off or remove them at intervals, and thus cause a firm hold or fitting of the cast metal upon the tube longitudinally as well as transversely.

LANE'S IMPROVEMENTS IN THE MANUFACTURE OF GOLD LEAF.

MR. J. LANE, of Birmingham, has recently introduced the following improvements in the manufacture of gold leaf. Instead of taking an ingot of gold alloyed with silver, copper, or other metal or metals, and rolling and beating the same into leaf, as is commonly practised, he takes an ingot of gold, or of gold alloyed with silver or other metal, the proportion of the metals being such that the gold in the said ingot is purer and more malleable than the gold generally rolled and beaten into leaf. To the opposite faces of the ingot of pure or alloyed gold are attached ingots of gold so far alloyed as may be necessary to give the required colour; or where the colour requires it, pure gold is used for the outer ingots. When alloyed gold is used for the outer ingots, it is preferred to make the alloy with copper or some other metal which will produce an alloy less malleable than the metal or alloy of which the middle ingot is composed. The three ingots are heated to incipient fusion, by which they are made into one mass. The process of making the compound ingot exactly resembles that by which silver is plated upon copper, and which is commonly called "sweating." The compound ingot is rolled and beaten into leaf in the ordinary manner. In gold leaf made in the ordinary manner—that is to say, of one uniform alloy—the colour of the leaf is frequently different in different parts; but in gold leaf, made according to this invention, the colour of the leaf is uniform over its whole surface. By making the interior of the ingot of pure or nearly pure gold, and placing the coloured or more alloyed gold on either side of it, a base is obtained for the leaf which is highly malleable, and which, on being rolled and beaten, carries with it uniformly the outer or coloured portions.

LEVAVASSEUR'S IMPROVEMENTS IN LAMPS AND LAMP CHIMNEYS.

M. F. G. H. LEVAVASSEUR, of Paris has recently patented* in this country certain

* Patent dated July 28, 1855.

improvements in oil lamps, and in the chimneys used with such lamps. His improvements refer to the raising and lowering of the wick, to an improved gallery for holding the chimney, to certain means of readily getting at the working parts of the lamps, and to an improved form of chimney specially adapted to all "candle lamps."

In the improved wick raiser and lowerer, the toothed rack and pinion now ordinarily employed are dispensed with, and instead of them is substituted a thin blade of metal made to press by a suitable spring between and into a groove cut in the periphery of a wheel or pinion, which is connected to an axis by which the wheel is worked, and the blade of metal to which the cotton or wick is attached, either directly or through a collar, is made to move up and down. For some lamps, the inventor fastens on to the axis for working the wick or cotton holder, a button with a cup stuffed with leather at its inner side, which prevents any oil from getting on the button.

The improved gallery is made by cutting a V or other similar shaped figure in three or more parts round the cylinder or ring forming the holder, and in pressing the metal slightly inwards at the parts where the cuts are made, so that a spring is formed which retains the glass steadily in the gallery.

In order to get at the body of moderator lamps, for the purpose of cleaning the same, M. Levavasseur forms the connection between the top of the barrel and the neck by screws, which will admit of the parts being detached by the user of the lamp, when required, and by means of washers, made of leather or any other flexible material, an air-tight joint is formed.

The improved chimney is specially intended for moderator oil candle lamps. The improvement consists in giving it a "swell" or "belly" around the flame, in narrowing it towards the top, and in terminating it in a bell mouth. This shape prevents the inside of the chimney from becoming blackened, prevents also, to a great extent, the breaking of the glass from being too near the flame, and forms a good support for a shade placed directly upon and round the chimney.

The Case of Josiah Marshall Heath, the Inventor and Introducer of the Manufacture of Welding Cast Steel from British Iron. By THOMAS WEBSTER, M.A., F.R.S., Barrister-at-Law. London: W. Benning and Co.

THIS is a very able statement of a case which is full of interest and instruction for inventors. It may be briefly put as follows: Mr. Heath, by experiment, observation, and chemical analysis, ascertained that the presence of a very small quantity—from one to three per cent.—of carburet of manganese in the melting-pot, produced from British iron a cast steel equal in welding quality to the cast steel produced from the best Russian and Swedish iron, and applicable to the same purposes. He, therefore, patented the use of carburet of manganese in the manufacture of steel; but within a few months after the date of his patent, and while the invention was being practically tried, he discovered, and communicated to the manufacturers the fact that, by using the known chemical elements of the carburet, instead of the substance itself, the same result might be obtained. This modification greatly reduced the cost of the manufacture, because the elements were cheaper than the carburet. It appears to have then occurred to a section of the steel manufacturers that they might relieve themselves from paying royalty to Mr. Heath, by employing the elements instead of the substance. They accordingly refused the payment of his claim, and, "relying on the refined distinction just adverted to, created out of their savings a common fund with which to contest his rights." Various suits at law followed—the decision of one court overthrowing that of the lower—until in 1855 the House of Lords pronounced against the patentee's claim, Mr. Heath having in the meantime died, "the anxiety and difficulties in which these attempts to protect his invention had involved him having, it is to be feared, hastened the event." Thus endeth the life of another inventor—"the author of an invention conferring commercial profits to be reckoned by millions."

Mr. Webster narrates the history of this modern tragedy of invention well, and inventors and patentees should read, mark, learn, and inwardly digest the lessons it teaches. He concludes the statement with the following suggestion, which is both reasonable and well-timed:

"Grants of money have been made by Parliament from the public funds to meritorious inventors; the legislature has delegated to the Judicial Committee of the Privy Council the recommendation of the extension of the term of letters patent, formerly exercised only by Parliament; the Judicial Committee has exercised that power most beneficially both for the inventor and the public; why should not the precedent be followed by Parliament delegating to the Judicial Committee the recommendation to the Treasury of such remuneration

in certain cases, not out of the public funds, but out of the funds levied on inventors, the surplus of which, above the payment of official fees or salaries to the Attorney and Solicitor-General, and the expenses of the office of the Commissioners of Patents, amounts to a very large sum? The appropriation of the Inventors' Fund to such purposes, and to the promotion of practical science, is an object of which inventors, as a class, would have no cause to complain, and from which the greatest benefits may be expected to result to the public."

The Drainage of London. A Letter addressed to the Metropolitan Board of Works, on the Value of the Sewage, the most economical mode of disposing of it, and the means of effecting its Application to Agricultural Purposes. By W. W. Pocock, B.A., F.R.I.B.A., &c.; Member of the Board of Works for the Westminster District. London: Ridgway, 1856.

This is a temperate and well-written pamphlet upon a subject, which, more than most others, requires careful consideration and investigation before any practical arrangements connected with it are determined upon. Many exceptions will unquestionably be taken to the statements and arguments of the author, but he nevertheless places before the reader, in a very striking form, the probable advantages of so collecting the sewage of London that it may be ultimately applied to agricultural purposes. Towards the end of the letter he says, "I make no doubt, but what, after a time, the sewage would not only pay for removal, but provide for the maintenance of the sewers themselves, *if not more*. It may not be at once, and it might not be for some years to come. This liquid could not (beyond a small residue) be carted or barged away to any advantage. Pumping is evidently the proper means, and this implies the erection of large and expensive works; and before capitalists will invest the necessary funds, they will expect to have guaranteed to them the whole, or at least an agreed portion, of any advantages to be derived during a course of years. And the interest of the ratepayers would be to accede to such a course."

CORT'S INVENTIONS.

To the Editor of the Mechanics' Magazine.

Sir,—In the article on this subject, printed in your Magazine, in December last, I stated, "I knew nothing of the routine of public offices to enable me to say in what way the Deputy-Paymaster could keep the seamen and officers of His Majesty's Fleet without their wages for seven years, unknown to his principal. I have, in the interval, made a considerable acquaintance with that routine, by examination of the Parliamentary Documents, containing the evidence on which Lord Melville was, in 1805, impeached of high crimes and misdemeanours, for gambling on the Stock Exchange, with the public money of his trust, in concert with the same Mr. Alexander Trotter, and one Mark Sprott, a broker, appropriating large balances, in connexion with the same *fidus Achates*, and in 1803, when a Naval Commission was appointed to inquire into the gross habitual disorders of the Navy Pay Office, for agreeing to burn, and accordingly burning, a few weeks before the Commissioners sat, the whole of the books and vouchers mutually passed between himself, Trotter, and *others*, for the expenditure of £134,000,000 of public money, disbursed by them in eighteen years, as Treasurer and Paymaster of the Navy. It is a truly frightful revelation, even to this age of railway and other joint-stock peccadilloes. To my astonishment, I find that the defalcations of Mr. Adam Jellicoe, which involved in ruin the greatest benefactor of the world, are a most prominent topic in the proceedings of the impeachment; but I am not at all astonished to find that the affidavit of Mr. Trotter (who, after his dismissal from office with ignominy, established the Soho Bazaar) was, to my apprehension, flat perjury. So far from the £27,500, which he *swears* he had paid to Jellicoe, having been paid *by him*, £20,000, *at least*, was advanced by Jellicoe to Cort *many years before Trotter entered the office as Paymaster.* Eight years had this embezzlement of the Deputy-Paymaster been standing, with full knowledge of the superiors in office; and they excuse their laxity, when detected, by asserting the *great national value* of the iron undertaking in which it had been advanced. The details are too voluminous for your pages, but, in continuation of my former paper, I wish to state the result. The treasurer, Lord Melville, having, as he states, treated the default of Adam Jellicoe with great lenity, under "sanguine hopes" of the productive returns from Mr. Cort repaying it, having watched through a series of years the gradual development of the inventions, up to the point when all the largest iron firms in the kingdom had signed contracts to pay very large royalties for the puddling furnace and grooved rollers, *then*, and not *till then*, his *lenity* to *Jellicoe* breaks down. When it was *quite certain* that he could, in a couple of years,

repay the money which he had been suffered to hold for eight years or more, through all the uncertainties of completing the inventions, patenting them, and bringing them into use, *then, and then only*, it was determined to exact payment by an *extent in aid*. In the summer of 1789, Cort's success had been made complete by the opening of the Cyfarthfa, Pennydarran, Dowlais, and other works, furnished with Cort's puddling furnaces and rolling mills. In August, 1789, Melville and Trotter begin to work upon their unhappy accomplice, Jellicoe, with certain propositions. The secrets of this den of vice, the Navy Pay Office, are not likely to be fully revealed, but the Commissioners ascertained that the terrors of an extent were first held over Jellicoe, on the 13th of August, though it is stated on the other hand that they did *not dare*, for fear of recrimination, to *act* against him. A certain amount of torture was, however, applied; but he, at least, appears to have possessed some conscience, for on the 29th of August a schedule of his effects, *including those of Cort*, having been prepared, by George Black, an accountant *called in* by Mr. Trotter for the purpose, Adam Jellicoe *suddenly died*. He could not support the horror and disgrace of being an accomplice in ruining his friend, the national benefactor, who had confided in his *reputed* high character, as a servant in great trust under the British crown, and his *reputed* wealth. On the 1st September, as soon as he was killed out of the way, Trotter makes the affidavit as if his default were *just discovered* by his death, and although Melville held all the contracts with the iron masters, which he had the year before, 1788, extorted from Jellicoe *as a security*, Trotter further swears that Cort is in decayed credit and very embarrassed circumstances, notwithstanding that £4,000 and upwards is actually owing at the moment from the Navy Board, for the contracts Cort was supplying; and directly afterwards, the Returns from the Jury of Gosport and Sheriff of Hants proved the value of the trade effects, stock, navy bills, &c., exclusive of the freehold premises and goodwill —value £20,000—to be more than £17,000, besides further large contracts with the Navy Board and large growing premiums in the patent rights. Having committed this swearing before B. Hotham, at Bulstrode, in the county of Bucks, (why he went out of town to swear will by-and-bye appear) he sends a writ *diem clausit extremum* to the sheriff of Hampshire, employing an *occasional solicitor* for the purpose, destroys, under it, Cort's property, expels him from the county, and puts *Samuel Jellicoe, the son of Adam the defaulter, into the premises*. To understand the horrible iniquity of this conduct, it must be known, first, that Adam Jellicoe was *not* Cort's partner. On the 8th day of January, 1781, an agreement was made between A. Jellicoe and Cort, that in consideration of the money advanced, H. Cort should assign to Adam Jellicoe, one-half of the freehold premises at Fareham, Fontley, and Gosport, which had been purchased by Cort at more than £20,000, and one-half of the patents he was about to take for his discoveries; and further that, in consideration of A. Jellicoe supplying Cort with certain moneys, he should take the son, Samuel Jellicoe, as a partner in trade, profits to be equally divided from the 8th January, 1781.

Henry Cort had, therefore, sold premises and patents to Jellicoe for the first money, and for further money he had sold the son half his trade and trade effects. Samuel Jellicoe, the partner, was not in a Crown office, and the extent in aid against Mr. Cort, for money advanced to him for a consideration eight years before, and which money, *if a defalcation*, had been winked at by four treasurers; namely, Mr. Elbore Ellis, Mr. Barré, Mr. Dundas, 1782, Lord Baynham, and Mr. Dundas again, 1784, was clearly illegal. But to make the infamy complete, Adam Jellicoe's effects, as scheduled by Black, amounted to over £89,000, out of which only a net balance of £13,000 was credited to Jellicoe, while all other properties were left for S. Jellicoe to enjoy. Cort was ruined and turned adrift; that alone was done. Samuel Jellicoe was put in undisturbed possession of his father's property and of Cort's property; the patents and contracts, one-half of which belonged to Cort, were held by the Navy Office until they expired; *at what gain to themselves*, Trotter, Dundas, and some others know. And after their expiration, and a *few days after Mr. Cort had died* (dead men tell no tales), Lord Melville had the impudence to petition the Treasury to be discharged from a debt of £24,856, for which he alleged he still remained liable, as the balance remaining, after every possible effort, unliquidated of the defalcations of Adam Jellicoe to Henry Cort. This discharge was granted by writ of privy seal, May 27th, 1800, though Mr. Pitt admitted, on the impeachment, that the Lords of the Treasury had taken *no inquiry or verification of the contents of the memorial*. A most memorable document, for it sets forth the "UNCONTESTED merit" of Mr. Cort's inventions, and their benefit to the nation, and lays bare the whole motives which actuated the memorialist and Mr. Trotter in

the ruin of the inventor. Lord Melville left office with a default (as extorted from Trotter's reluctant evidence by the peers) in his balance over £191,000, and his memorial of 1800 candidly tells the Lords of the Treasury that he hoped that a *Parliamentary reward*, for these great inventions which he *had secured*, would have provided him with a fund to pay his own debts. *Monstrous!* All these transactions were revealed by the searching inquiries of the Naval Commissioners (see their Tenth Report); but *complete* information was barred by the *burning of the documents*, and the refusal of Lord Melville (who had just been rewarded with a peerage, and pensions for self and wife of £3,000 a year, and appointed, besides, First Lord of the Admiralty), Mr. Trotter, and others to answer questions *criminating themselves*.

We can now fully understand why the Committee of 1812 voted that the inventions of Henry Cort, from which Lord Melville "sanguinely hoped for a Parliamentary reward" in 1800, were of no value in 1812, when his *children* asked for such a reward. When that Committee, with its chairman, disgraced themselves, the name of science, and the nation's honour by voting there was no merit or novelty in the puddling furnace and grooved roller, Robert Viscount Melville, son of the culprit who had been let off *scot free*, in 1806, for the hanging crime of burning the vouchers of £134,000,000 of public trust money, by force of forty Scotch peerage proxies in his pocket, and forty Scotch commoner votes at his command, and with his name struck from the list of the Privy Council, had retired to the happy land of Dundasia (as Harry Brougham had christened in those primeval days the northern hive, when he little expected many strange events which have been since evolved from the mighty womb of time)—I say, his son Robert, second Viscount, was, in 1812, sitting ensconced as First Lord of the Admiralty, Governor of Greenwich Hospital, and other good things, to the value of £10,749 yearly, besides further yearly pensions to the happy family in Dundasia of £12,900! How very uncomfortable it would have made this worthy Celtic circle, the Lady Jane with £1,500 a year, David with £600 a year, and five small children, &c., to have raised any slumbering demon, by inquiry into the circumstances of Mr. Cort's ruin. The Committee preferred taking "the short way with inventors," and so cut the knot by voting that there was neither novelty nor value in the British iron trade; and, like Mr. Meagles (though with a worse heart), they ejected from Parliamentary consideration that "public enemy," an inventor, or an inventor's child. The differenc efrom the Circumlocution Office in Mr. Cort's case seems to be, that the navy officials knew very well *how to do it*.

I have the most "sanguine hopes," to use a Dundasian phrase, that this unutterably infamous case will crown the climax of enlightened effort, and furnish the momentum to roll the British inventor into his proper position. There is a great stir; I have fought hard for many years, for many inventors; and in the present movement there is a prospect of a general measure of justice. I am, Sir, yours, &c.,

DAVID MUSHET.

February 24, 1856.

MECHANICAL LOCOMOTION.

IN A LOCOMOTIVE ENGINE, WHAT IS THE FULCRUM OF THE ENDLESS LEVER OR WHEEL?

To the Editor of the Mechanics' Magazine.

SIR,—In a recent discussion in your Magazine, the ideas of some of your correspondents exhibited great confusion on the subject of the leverage in locomotive vehicles. The notice which you take in your last number (No. 1698) of a correspondent, "C.," shows that he also is bewildered in a similar manner, and the perplexity arising out of the same entanglement of ideas prevails, I have no doubt, very extensively among our mechanicians. Some fifteen or twenty years since I took part in a discussion in your pages on this very subject, on which occasion I proved that the difficulty has arisen from the very prevalent idea that the rail, the road, or the water, as the case may be, is the fulcrum of the locomotive lever. When the *moving* force is not external to, but moves with the moved vehicle, the fulcrum is of course some part of the vehicle itself, on which supposition only, can a crank actuating the endless lever, the wheel, become what experimentally it is proved to be, the medium of a uniform propelling force, whether (being at the same angle) it happens to be above or below the centre of motion—that is to say, whatever may be its position, the obliquity of action is found to be the sole cause of variation in its leverage, and not any change in the character or power of the lever as acted on at right angles. But on the supposition of the rail being the fulorum, and not the journal of the axle, this change would be continually occurring, for with every revolution of the wheel, the leverage would alter, at one moment acting with advantage and at the next with disadvantage, which is known not to be the case. If the axle revolves through the medium of a cog-wheel affixed to it, it will be equally a matter of indifference, in

respect to the uniformity of the power communicated, whether another wheel is in gear above or below, before or behind; for the relation to the fulcrum at the centre of motion remains the same in any position.

It says little in favour of the "harmony of theory and practice in mechanics" to which, as the subject of Professor Rankine's lecture, you draw in the same number the attention of your readers, that this confusion of ideas has arisen from its having been inculcated in the elementary part of all works on mechanics from time immemorial, that when a man rows a boat, he has the water for a fulcrum, and a lever of the second order for his oar.

I am, Sir, yours, &c.,
BENJAMIN CHEVERTON.

THE SMOKE QUESTION.

To the Editor of the Mechanics' Magazine.

SIR,—In answer to the "inventor of Gardner's patent smoke consumer," I beg to call his attention to page 82 of your Magazine, No. 1694, January 26th, 1856, where he will find that I gave the saving in fuel by the double fire-place as being nearly twelve per cent. over the old method; and with regard to the "vexed question" of consuming *the visible smoke*, or *the gaseous invisible products thereof*, by passing it or them over or *through an incandescent adjoining fire*, I will only give an instance of what I can do at any moment.

Place upon the fire to be fed plenty of fresh coal, rout it till you have produced a tail of black smoke from the chimney half a mile long, then suddenly close the damper, and the issue of smoke shall be as suddenly cut off.

I think your correspondent gives a wrong version of Cubitt's condensing apparatus. As described to me, it appeared to be effected by dividing the chimney up to a certain height, the smoke being passed up one side of this division and down the other into the sewer. At the top of the descending shaft a cistern was placed with a perforated bottom, so that it continually rained upon the smoke just at the point of descent and condensed it; my informant added, "and saved twenty-five per cent. of fuel," which, I take it, was a perfect mistake.

I will only add, that coke or anthracite coal does not suit the majority of my operations.

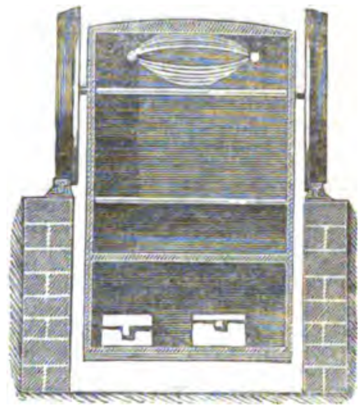
I am, Sir, yours, &c.,
ANDREW B. BRANDRAM.

Brandram Brothers and Co.'s Works,
Rotherhithe, 5th March, 1856.

A SUGGESTION ON RAILWAYS.

To the Editor of the Mechanics' Magazine.

SIR,—Would it not be possible to prevent some of the fearful accidents which occur on railways by the principle of construction illustrated in my sketch, viz., to have the wheels placed very high up on the body of the carriage, and to run the latter in a trench cut out in the railroad.



Where a cutting had to be made, the cost would, I should think, be not much more than it is at present, and where an abundance of stone could be procured a double wall might be built for the carriages to run between, and even where stone could not be obtained, heavy mud walls might be constructed and faced with brick. On top of these walls on the inner edge should be placed the sleepers, and on these the rails.

Below each carriage might be an under compartment for the baggage, so as to increase the weight beneath, and at the same time to do away with the luggage van. Were railroads so constructed there can be no reason why trains should not be run at 100 miles an hour with perfect safety, since, the centre of gravity of each carriage being beneath the point of its suspension, upsetting would be out of the question. The axle might pass between the compartments of the carriage, and the latter be supported on it by springs abutting against the roof of the carriage. Thus the latter would be supported at the roof, instead of on its bottom.

I think the extra speed and safety which would be obtained would be quite enough to compensate for the extra cost of construction.

I am, Sir, yours, &c.,
F. MAXWELL LYTE.

Norton Manor, near Taunton,
February 17, 1856.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

HUNT, J. *An expanding and contracting self-fastening band.* Application dated July 26, 1855. (No. 1697.)

This band consists of strips of linen and paper, cotton and paper, or other materials, put together or single, and made with a row or rows of metal eyes at one end, and corresponding hooks at the other.

BROWN, W. *Improvements in machinery or apparatus for combing wool or other fibrous substances.* Application dated July 26, 1855. (No. 1699.)

These improvements consist in applying gill combs, or combs acting as such, so that their teeth in operating may point in a direction at right angles to, or across, those of the receiver or carrying from which they are taking the fibre.

HANCOCK, R. H. *Improvements in the means of stopping carriages or trains to prevent railway accidents.* Application dated July 26, 1855. (No. 1700.)

Upon one of the axles of the carriages is fixed a threaded worm in connection with a worm wheel, so arranged that the driver or guard can throw the same in and out of gear by means of a lever.

THOMPSON, C. *Certain improvements in furnaces, with a view to the prevention of smoke.* Application dated July 26, 1855. (No. 1701.)

On each side of the furnace the inventor forms a flue, which he connects with a hollow bridge near the bottom of the furnace, this bridge being perforated in the front and upon the top, so that two currents of heated air pass into the bridge, issue from the perforations, and combine with the combustible gases given off by the fuel, and ensure their combustion.

GOODYEAR, C. *An improvement in the manufacture of gunpowder.* (A communication.) Application dated July 26, 1855. (No. 1703.)

This invention consists in applying India-rubber or gutta percha with sulphur and saltpetre in the manufacture of gunpowder.

GOODYEAR, C. *Improvements in carpet and other bags.* (Partly a communication.) Application dated July 26, 1855. (No. 1704.)

This invention consists of improved apparatus for closing the mouths of carpet and other bags. For this purpose the mouth of a bag is to have a cord, or wire, or other thickening, fixed around it, in such manner that the two sides of the mouth may be held parallel to each other.

EFFERTZ, P. *Improvements in machinery for cutting, creasing, or marking paper, card, and pasteboard, and other like substances.* Application dated July 27, 1855. (No. 1709.)

These improvements consist in constructing a machine in which the paper or other substance to be cut is placed upon a fixed bed, and in which an upper holding beam is brought down upon the paper or other substance, and holds it firmly while being cut. A shaft with bevel wheels at an angle runs horizontally under the machine. The holding beam has connected to it two female screws, into which two male screws are made to bite. The screw shafts carry bevel wheels, also set at an angle, which are driven by the bevel wheels upon the horizontal shaft. A hand wheel is keyed on to the horizontal shaft, and by turning it in one direction or the other, the holding beam is brought up or down.

SMITH, A. *Improvements in portable cases or holding receptacles for cigars, spectacles, cards, cutlery, and other articles.* Application dated July 27, 1855. (No. 1713.)

This invention relates to the so arranging and constructing of portable cases or holders intended for containing and conveying various small articles, that the following advantages may be secured.—1. Perfect security when the case is closed. 2. Facility of fully opening and closing. 3 Exposure of the contained articles to the extent desired.

ABRAHAM, H. R. *A carriage on two wheels for passenger traffic and general conveyance of a number of persons, or invalid, or wounded persons, to be called a rotaltar.* Application dated July 28, 1855. (No. 1716.)

This invention consists of "an arrangement and adjustment of the body of the carriage, its seats and springs, which admit of their being carried on one axle with ease and security, the seats on the roof being nearly perpendicularly over the axle across the carriage in a line with the axle, thus balancing or regulating the weight in reference to the draught, and rendering it easy." [A carriage called the "Cosy Express," constructed upon a principle somewhat resembling the foregoing, built from a design of Mr. Abrahams, is now running between the Bank and Piccadilly, London.]

BARRY, H. H. *Improvements in machinery for combing or carding wool, flax, mohair, and other fibrous substances.* Application dated July 28, 1855. (No. 1717.)

These improvements consist of an arrangement of machinery whereby those substances may be taken up by combs or brushes, rotating on a swift or cylinder, and combed, carded, and discharged by mechanical means.

HYDE, J. *Improvements in furniture-castors.* Application dated July 28, 1855. (No. 1719.)

These improvements consist—1. In connecting the wheel of the castor to the socket

in which the pivot works, by means of pins or points cast with, or otherwise fixed into, the socket of the castor. 2. In constructing castors formed as above with loose collars or washers against which the socket rests when in use. The end of the pivot is pointed, and bears against it as usual.

WILSON, R. *Improvements in folding and preparing or pressing woven fabrics and other materials.* Application dated July 28, 1855. (No. 1720.)

This invention relates to self-acting apparatus for folding pieces of woven fabrics, or of any material in the form of a long web, and comprehends various novel contrivances, together with the capability of folding goods to be hot pressed, the pasteboards being, in this case, placed in the folds of the goods as the folding proceeds.

BROWNFOOT, W. *A new or improved instrument or apparatus for raising, lowering, and adjusting blinds, maps, and other such like articles.* Application dated July 28, 1855. (No. 1721.)

This invention consists of an apparatus somewhat resembling the ordinary roller blind; that is to say, consisting of a roller on which the blind or other article is wound, and which has at one end an axis or drum on which the blind cord is coiled, by pulling which cord the blind is raised.

WILLIS, F. *An improvement in the manufacture of wine-bottles.* Application dated July 28, 1855. (No. 1723.)

This invention has for its object the manufacture of wine-bottles with roughened interior surfaces to prevent the crust of port and other wine from slipping. For this purpose the interiors of wine-bottles are rendered rough either during the process of making them or after they are formed.

DAFT, T. B. *Improvements in inkstands.* Application dated July 28, 1855. (No. 1724.)

These improvements consist of means of acting on a flexible air-tight cover or diaphragm over an opening into the upper part of the ink vessel.

GOODYEAR, C. *Improvements in manufacturing covers for floors when compounds of India-rubber are used.* Application dated July 28, 1855. (No. 1725.)

This invention has for its object the manufacture of covers for floors, by making coloured and ornamental sheets of India-rubber combined with sulphur, with or without other matters, and subjecting such compounds to heat, in order to change the ornamented sheets into hard compounds of India-rubber.

PEACOCK, J., and H. H. BARRY. *Improvements in instruments for making copies of writings simultaneously with the originals.* Application dated July 30, 1855. (No. 1726.)

This invention relates to an instrument constructed on the principle of the pentagraph, in which one pen is held and used by the writer in writing the original, but so connected with a second, or second and third pen, as to produce two or more copies at the same time.

CLUNES, T. *Improvements in pumps and fire-engines.* Application dated July 30, 1855. (No. 1731.)

This invention relates to a form of pump wherein the cylinder or working barrel is the moving part, no piston or bucket proper being required.

WHITEHEAD, J. H. *Improvements in the construction of steam-boiler furnaces.* Application dated July 30, 1855. (No. 1733.)

This invention relates primarily to the placing of an arched or other covering over the fire-place so as to prevent or to modify the direct action of the flame upon the boiler.

COLBY, H. *Improvements in the construction of an instrument for taking altitude angles, called an improved altimeter, or self-adjusting quadrant.* Application dated July 31, 1855. (No. 1736.)

These improvements consist in making use of half a circle, or 180°, for taking observations, and having this half circle suspended below the plane of the telescope or glass to which it is attached; and also in counteracting, in a described manner, any tendency to undue oscillation in the self-adjusting part of the instrument, and in attaching the whole instrument, when desired, to a stock similar to a gun-stock, to assist in taking more correct observations.

DALMAN, G. J. *An improvement in the manufacture of glazes for earthenware.* Application dated July 31, 1855. (No. 1737.)

This invention has for its object the application of native borate of lime combined with carbonate of soda in the manufacture of such glazes.

DUPONT, L. N. *Improvements in making an improved fabric, called drap de soie.* Application dated July 31, 1855. (No. 1738.)

These improvements consist in making a new fabric from the waste arising from the combing of silk, and the waste from the cocoon, the warp and weft being entirely of this material, without any mixture of cotton or wool.

CLARKE, J. *Improvements in machinery for making loop fabrics.* Application dated August 1, 1855. (No. 1743.)

In the improved machinery a series of hooks are employed side by side on a bar, similarly to needles in warp machinery, but the hooks may be caused to slide back separately and to exchange positions. Guides on a bar or bars are used, and a bar with bent points arranged to take the work off the hooks, and to pass it over the heads of hooks, or on to the guides, so that the

work may be held on the guides while the latter loop their threads on the hooks.

VAUGHAN, C., W. J., and R. *An improvement or improvements in making and attaching the handles of iron bowls and other iron vessels.* Application dated August 1, 1855. (No. 1744.)

This invention consists in making the tangs or handles of bowls and other iron vessels in the following manner. The inventors take a piece of iron of the length of the tang to be made, and place upon that end which is to be spread into what is called the bit a short cross piece of iron. These pieces of iron are then raised to a welding heat, and welded by a pair of dies, which also spread the cross piece out into the form of the bit.

*** The documents of Nos. 1774 and 1776 are with the law officers under objection.

PROVISIONAL PROTECTIONS.

Dated January 3, 1856.

20. Hermann Brambach, of Cologne, Prussia. Converting dry pitch and other resinous substances, also coal tar and other tars, into neutral essential oils.

Dated February 2, 1856.

289. James Townsend Ward, of Swansea, Glamorgan, manufacturer. A new or improved omnibus.

293. William Joseph Curtis, of Sebbon-street, Islington, Middlesex. Improvements in machinery for excavating land for the constructing tunnels.

Dated February 4, 1856.

296. Richard Clarke Pauling, of Great George-street, Westminster, civil engineer and surveyor. Expelling water from vessels and keeping them from sinking, raising sunken vessels, keeping water out of coffer dams, caissons, foundations, or vessels, or works that are below water, and propelling vessels on and through water.

297. Rudolph Bodmer, of Thavies-inn, Holborn, London. An improved lubricating oil. A communication.

299. Elisha Smith Robinson, of Bristol, paper merchant. Improvements in machinery for lithographic and zincographic printing.

300. Charles Henry Hudson, of Highbury-cottages, Holloway-road, Middlesex, joiner. A retiring door or lid for boxes, cabinets, closets, rooms, carriages, and for all places or receptacles where or in which doors or lids are at present in use or may be used.

301. Edwin Clark, of Great George-street, Westminster. An improvement in the apparatus for suspending insulated electric telegraph wires.

303. John Thomson, of Newton-le-Willows, Lancaster, sugar-refiner. Improvements in centrifugal apparatus to be used in the separation of liquids from granular and crystalline matters.

305. William Allen Turner, of Wood-street, Cheapside, London. India rubber manufacturer. An improved preparation or mixture to be used in the manufacture of compounds of India rubber or caoutchouc.

Dated February 5, 1856.

307. George Cumins Thomas, of Washington, United States. An improved method of hardening and tempering steel. A communication.

309. Thomas Hinchliffe, of Mill-bridge, Liversedge, York, engineer. Certain improvements in machinery or apparatus for drawing and spinning wool or other fibrous substances, or wool mixed with other fibrous substances.

311. Theodore Bergner, of Philadelphia, United States. Embossing veneers, so as to represent carvings in wood. A communication from I. Amies, of Philadelphia.

313. James Howard, of Bedford, agricultural implement maker. Improved apparatus for making moulds for castings.

315. Alfred Augustus de Reginald Hely, of Oxford-street, Middlesex, glass merchant. Certain improvements applicable in the burning of gas.

317. Henry Squire, of Ludgate-hill, London. An improved seal or fastening for envelopes, deeds, and documents.

Dated February 6, 1856.

319. Joseph Thomas, of Finsbury-square, Middlesex, gentleman. Improvements in the manufacture of soap from the greasy matters obtained from the refuse water, wash, or suds, used in woollen or other manufactures or processes. A communication.

321. John Fletcher, of Salford, Lancaster, iron, founder, and William Fletcher, of the same place, millwright. Improvements in the construction of weighing cranes, and other similar elevating machines.

323. Henry Alfred Jowett, of Kentish-town, London, engineer. Improvements in railway breaks and carriages, and in signals connected therewith.

325. Thomas Frederick Tyerman, of Weymouth-street, Middlesex, architect and surveyor. Improvements in apparatus to be applied to omnibuses and other carriages for receiving wet umbrellas.

327. James Edward Duyck, of Wandsworth, Surrey, gentleman. Improvements in the manufacture of oil cake.

329. James Meacock, of Snow-hill, London, gas-meter maker. An improved means of fixing diaphragms in gas meters.

Dated February 7, 1856.

331. Theodore Bergner, of Philadelphia, United States. A new mode of preparing or facing surfaces of engraved or etched plates of metal, or other substance, so that they may be readily printed from by a press without wiping. A communication from S. W. Lowe, of Philadelphia.

333. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. A method of obtaining alcohol from the fruit or pod of the carob tree. A communication from John Minghelli.

Dated February 8, 1856.

335. John Woodman, of Manchester, Lancaster, engineer. An improved telegraph insulator.

336. Theophile Francois Trocard, artist, of Bordeaux, French Empire. An improved coffee-pot.

338. Henry Alfred Jowett, of Kentish-town, London, engineer. Improvements in rails used for the construction of the permanent way of railways, and in the means of laying down and fixing them in conjunction with the present rails in use.

339. Stewart Robertson and James Howden, of Glasgow, Lanark, engineers. Improvements in machinery or apparatus for driving piles.

340. Charles Walker, of Glasgow, Lanark, engineer. Improvements in safety-valves and in apparatus for cleansing or purifying water in steam-boilers.

341. John Billington Booth, spindle manufacturer, and James Beckett, overlooker, of Preston, Lancaster. Improvements in machinery for pre-

paring and spinning cotton, wool, and other fibrous materials.

Dated February 9, 1856.

342. Charles Swan and George Frederick Swan, of High-street, Southwark, ink manufacturers. An improved colouring matter for writing, staining, or dyeing, which is also applicable to the production of a copying fluid. A communication.

344. George Wailes, of Palace-row, New-road, Middlesex, engineer. Improvements in the construction of valves for regulating the passage of gas and other fluids.

346. John Rawlings, of George and Catherine-wheel-yard, Bishopsgate-street, London. Improvements in envelope or stationery cases.

347. Edward Martin, of Oxford. Improvements in cricket-bats.

348. Theophilus Burton, of Lincoln, engineer and agricultural implement maker. An internal boiler cleaner or mud stirrer for the effectual cleaning of steam boilers from muddy deposits and all kinds of sediments.

350. Louis Schwartzkopff, of Berlin. Improvements in apparatus for raising mud and soil from the bottoms of rivers and other waters.

351. William Augustus Bullard, of Dedham, Massachusetts, United States. An improvement in instruments for fastening doors. Partly a communication.

Dated February 11, 1856.

352. Christophe Muratori, of Paris, doctor of physics. Improvements in the waterproofing of hangings or ornamenting stuffs.

353. William Horatio Harfield, of Fenchurch-street. Improvements in the manufacture of metallic screw nuts. A communication.

Dated February 12, 1856.

356. Henry Bessemer, of Queen-street-place, New Cannon-street, London, civil engineer. Improvements in the manufacture of malleable or bar iron and steel.

358. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Surrey. An improvement in treating fats and oils. A communication.

360. Felix Pruss Jablonowski, of Brussels, Belgium. A new process of chromo-lithographic painting on glass, porcelain, clays, lava, and other materials susceptible of vitrifaction, and on all metals and metallic compounds capable of receiving an enamelled surface.

Dated February 13, 1856.

362. Pierre Isidor David, of Paris, France, machinist. Certain improvements in the method of bleaching.

364 Louis Vignat, of Place des Victoires, Paris, merchant. A regulator-compensator for the weaving of ribbons and cloths.

376. Samuel Fox, of Stocks-bridge, Peniston, York, wire manufacturer. Improvements in springs for railway and other carriages.

368. William Gilchrist, of Kirkintilloch, Dumbarton, manufacturer. Improvements in ornamental weaving.

370. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in the construction of fire-arms. A communication.

372. Henry Fort Mitchell and William Mitchell, whitesmiths, and John Clarkson, coal merchant, of Silsden, near Keighley, York. Improvements in sewing machines.

374. Gustave Louis Keller, of Paris, France, pocket-book maker and manufacturer. A new kind or system of carpet or travelling bag.

Dated February 14, 1856.

376. Thomas Parkinson Capp, of Gracechurch-street, London. An improved lamp.

378. Henry Robert Ramsbotham and William Brown, of Bradford, York, wool combers. Improvements in combing wool, alpaca, cotton, and other fibrous substances.

382. George Pate Cooper, of Sutherland-square, Walworth, Surrey, shirt maker. An improved shirt collar.

384. William Hammond Bartholomew, of Brunswick-terrace, Leeds. Improvements in propelling vessels when screws or submerged propellers are used.

388. Charles Cowper, of Southampton-buildings, Middlesex. Certain improvements in impregnating wood with preservative and colouring materials, and in apparatus for that purpose. A communication from the late H. Boucherie, of Bordeaux, France.

390. Edouard Deiss, of Paris, France, manufacturer of chemical products. A method or methods of, and apparatus for extracting oils, fats, greases, and resins from bones, raw wool, seeds, and other substances containing the same, and recovering a certain agent employed in the process.

Dated February 15, 1856.

392. Alexandre Tolhausen, of Duke-street, Adelphi, Middlesex, interpreter at the Imperial Court of Paris. A machine for cutting articles of polygonal figure in wood or other material. A communication from A. Stoeckel, of New York, United States.

394. James Hogg, jun., publisher, of Nicolson-street, Edinburgh. Improvements in the manufacture of envelopes and certain other combinations and applications of paper and gum, denominated "Letter Checks" for containing and securing written, printed or other communications.

396. Eddlestone Elliott, woollen manufacturer, Cyrus Leach, blacksmith, and James Ratcliffe, spinner, of Rochdale. Improvements in machinery for spinning wool and other fibrous substances.

398. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery for making boots and shoes. A communication.

Dated February 16, 1856.

400. Frederic Daniel Grant, of Newgate-street, London, lithographer. A method of rendering printing inks and wax odoriferous.

402. George Harrison of Little Goodwin-street, Hull, York. Improvements in axles for railway carriages.

Dated February 18, 1856.

406. James Strang Thomson, of Kilmarnock, Ayr, manufacturer, and Andrew Barclay, of the same place, engineer. Improvements in printing and embossing textile fabrics and other surfaces, and in the production of apparatus to be employed therein.

408. Moses Jones, William Broad Rowe, and William Perrins, of Broad-street, Worcester, manufacturing ironmongers and copartners. An improvement in ranges.

410. William Hale, of Swan-walk, Chelsea, Middlesex, engineer. Improvements in propelling boats or other floating bodies.

Dated February 19, 1856.

412. Henri Gerbaut, of Mulhouse, France. Improvements in the manufacture of vinegar.

414. Frederick Austin Spalding Witter, of Manchester, Lancaster, agent. An improved stove. A communication.

416. Stephen Fitchew Cox, of Bristol. Improvements in the manufacture of leather, and in machinery for that purpose.

418. John Gedge, of Wellington-street South, Middlesex. Improvements in pumps. A communication from A. Andrien, of Castres, France.

420. William Gwillim Merrett, of Leadenhall-street. An improvement in trousers and drawers.

422. Richard Wavgood, of Newington-causeway, Surrey, engineer. An improved portable laundry, or combined boiling, washing, mangling, and drying and ironing apparatus.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

423. William Aristides Vérel, of Macduff, Banff, Scotland, merchant. Improvements in grinding or pulverizing hoofs and horns, and in using them alone or mixed with pulverized bones for manure. February 20th, 1856.

481. Louis Arnier, of Marseilles, France. Improvements in condensing hot air and obtaining motive power therefrom. February 25, 1856.

NOTICE OF APPLICATION FOR PROLONGATION OF PATENTS.

A petition will be presented to the Judicial Committee of the Privy Council by William Longmaid, of Victoria-cottage, Stoke Newington, gentleman, Thomas Julian Pode, of Plympton, Devon, surgeon; Alfred Hingston, banker, and William Joseph Square, surgeon, both of Plymouth, praying for a prolongation of the several letters patent granted to William Longmaid for England, 20th October, 1842; for Scotland, 13th March, 1843; and for Ireland, May 4th, 1843, for "Improvements in treating ores and other minerals, and in obtaining various products therefrom, certain parts of which improvements are applicable to the manufacture of alkali."

Any person desirous of being heard in opposition must enter a caveat to that effect in the Privy Council Office on or before the 5th April next.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," March 4th, 1856.*)

2355. Frederick Whitaker. Improvements in the construction of sewing-machines.

2361. Charles Lenny. Improvements in carriages.

2370. Thomas Roberts and John Dale. Certain improvements in treating and preparing amylecious substances for the purpose of stiffening.

2382. Ellis Butterworth. Improvements in machinery or apparatus for preparing, spinning, and doubling cotton, wool, and other fibrous materials.

2383. Charles Crickmay and Frederic Joseph Clowes. Improvements in the manufacture of guns, pistols, and gun-stocks, and in cutting and carving wood, metals, minerals, and other materials, by machinery.

2385. Eugene Hippolyte Rascol. Improvements in apparatus used in the manufacture of type and other articles for letter-press printing. A communication.

2387. Henry Tritton. An improved safety-apparatus for the protection of persons while painting the exterior of buildings and cleaning windows, which may be used as a balcony for holding flowers.

2389. James Platt and John Whitehead. Improvements in machinery or apparatus for preparing clay for the manufacture of bricks.

2398. Henry Wyatt. A peculiar apparatus for more rapidly and perfectly manœuvring or steering steam-ships of war or of commerce, which is entitled "The Transpulsor."

2399. Simon O'Regan. Improvements in marine engine boilers and other boilers and their furnaces.

2402. George Geyelin. An improved construction of perambulator.

2410. Joseph Whitworth. Improvements in artillery and fire-arms.

2413. Germain Jean Paul Marie Villeroux. Certain improvements in the manufacturing of soap.

2414. William Hartley. Improvements in safety-valves.

2423. William Henry Walenn. Self-acting attachment to be applied to gates. A communication.

2424. Robert Griffiths. A compound and exact measurement tap, applicable to the measurement of every kind of liquor or liquid.

2451. Robert Cook. Improvements in apparatus for effecting the operations of punching, riveting, and shearing.

2466. William Gardner. An improved method of manufacturing watches or other timekeepers, and also improvements in the machinery, tools, or apparatus for accomplishing the same.

2481. George Burridge. Improvements in the preparation of glass for ornamental purposes.

2487. Richard Archibald Brooman. Improvements in fire-arms. A communication.

2488. Joseph Jessop. Improvements in the construction of furnaces and boilers.

2490. Richard Goose. Improvements in the manufacture of cut nails.

2495. Edward Jeffreys. An improvement in the construction of furnaces.

2562. Thomas Skinner. Improvements in producing figures or ornaments upon the surfaces of metals.

2578. William Lea. An improvement or improvements in taps or cocks.

2653. Charles Sanderson. An improvement in the manufacture of iron.

2666. Thomas Allan. Improvements in applying electricity.

2695. James Egleson Anderson Gwynne. Improvements in instruments for indicating pressure or vacuum

2696. Charles Maybury Archer. A new material for the manufacture of paper, and for the production of textile fabrics.

2702. Edward Daniel Johnson. An improvement in the construction of attachable seconds watches.

2708. William Ward. Certain improvements in looms for weaving.

2839. William Clay. Improvements in the manufacture of bar iron.

2894. James Murdoch. Improvements in machines or apparatus for working chain stitch embroidery. A communication.

2917. Richard Archibald Brooman. Improvements in treating beetroot, and other saccharine vegetable substances, in order to extract alcohol therefrom, and at the same time render or leave the remaining parts of the vegetable fit food for cattle. A communication.

2923. Thomas Duppa Duppa. Improvements in generating and heating steam. A communication.

91. Charles François Leopold Oudry. Certain improvements in the preservation of metals and other solid substances.

93. William Owen. Improvements in the manufacture of railway wheels and tyres.

10 . William Owen. Improvements in stoves and fire-places.

204. Alexander Dalgety. Improvements in vices, or gripping or holding apparatus.

206. William Owen. An improvement in pianofortes.

231. Jean Hector Destibeaux. An improved waterproof fabric.

297. Rudolph Bodmer. An improved lubricating oil. A communication.

307. George Cumins Thomas. An improved method of hardening and tempering steel. A communication.

340. Charles Walker. Improvements in safety

valves, and in apparatus for cleansing or purifying water in steam boilers.

350. Louis Schwartzkopff. Improvements in apparatus for raising mud and soil from the bottoms of rivers and other waters.

354. William Horatio Harfield. Improvements in the manufacture of metallic screw nuts. A communication.

356. Henry Bessemer. Improvements in the manufacture of malleable or bar iron and steel.

366. Samuel Fox. Improvements in springs for railway and other carriages.

368. William Gilchrist. Improvements in ornamental weaving.

370. William Edward Newton. Improvements in the construction of fire-arms. A communication.

384. William Hamond Bartholomew. Improvements in propelling vessels when screws or submerged propellers are used.

388. Charles Cowper. Certain improvements in impregnating wood with preservative and colouring materials, and in apparatus for that purpose. A communication.

394. James Hogg, jun. Improvements in the manufacture of envelopes and certain other combinations and applications of paper and gum, denominated "Letter Checks," for containing and securing written, printed, or other communications.

398. William Edward Newton. Improved machinery for making boots and shoes. A communication.

406. James Strang Thomson and Andrew Barclay. Improvements in printing and embossing textile fabrics and other surfaces, and in the production of apparatus to be employed therein.

416. Stephen Fitchew Cox. Improvements in the manufacture of leather, and in machinery for that purpose.

422. Richard Waygood. An improved portable laundry, or combined boiling, washing, mangling, and drying and ironing apparatus.

428. William Aristides Vérel. Improvements in grinding or pulverizing hoofs and horns, and in using them alone or mixed with pulverized bones for manure.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

477. William Symington.
510. William Edward Newton.
514. John M'Adams.
522. Edward Duke Moore.
525. Robert Waddell.
526. Marcel Vetillart.
532. Robert Barclay.
535. Samnel Colt.
538. Samuel Colt.
542. Thomas Crick.
562. Richard Barter.
571. Thomas Weatherburn Dodds.
574. Thomas Weatherburn Dodds.
575. Augustino Carosio.
592. James Kimberley.
594. Samuel Blackwell.
595. Samuel Blackwell.
646. Joseph Maudslay.
654. Samuel Colt.
719. Charles Augustus Holm.

LIST OF SEALED PATENTS.

Sealed February 22, 1856.

2799. Robert Adam Whytlaw.
2801. Alfred Vincent Newton.

Sealed February 26, 1856.

1933. Celse Eugène Capron.
1935. Thomas Alexander Cooling.
1936. Charles Humfrey.
1938. James Smith.
1942. Charles Humfrey.
1948. Edward Newman Fourdrinier.
1966. Rudolph Schramm.
1980. William Smith.
1982. Alfred Heaven.
1996. William Woodcock, Thomas Blackburn, and James Smalley.
2020. William Armand Gilbee.
2026. John Stewart.
2102. Richard Archibald Brooman.
2124. Ursurer, Joseph Brasseur.
2150. Thomas Deakin.
2166. Robert Robey and George Lamb Scott.
2726. William Foot.
2792. Jacques Elidat de Malbec.

Sealed February 29, 1856.

1953. John Hanson.
1955. James More.
1959. Charles Frederick Stansbury.
1968. George Frederick Rose.
1971. Matthew Butcher and Thomas Henry Newey.
1977. Thomas Symes Prideaux.
1979. Alfred Vincent Newton.
1983. George Thomas Holden and Richard Nicholas.
1984. Thomas Joseph Larmuth and John Smith.
1988. William Henry Zahn.
1991. John Humby.
2017. Christopher Penrhyn Aston.
2053. Henry Bull.
2059. Etienne Charles Zacharie Bouchard.
2083. Henry Chandler.
2085. David Hill.
2103. Charles Tilston Bright and Edward Brailsford Bright.
2207. Richard Archibald Brooman.
2335. William Glass.
2404. Joseph Hands.
2425. James Gray Lawrie.
2628. Henry William Wimshurst.
2705. Edward John Davies.
2723. Samuel Garn.

2863. Alfred Vincent Newton.
2889. John Watson.

Sealed March 4, 1856.

1999. Thomas Taylor Coniam.
2008. William Craymer.
2013. Joseph Gilbert Martien.
2014. Ichabod Nettleship.
2016. Theodore Schwartz.
2021. George Lowry
2036. Anguish Honour Augustus Durant.
2038. Anguish Honour Augustus Durant.
2040. Anguish Honour Augustus Durant.
2042. Henry Webster.
2056. François Honoré Lebaigue.
2086. William Sangster.
2088. David Zenner.
2110. William Warren.
2116. Richard Archibald Brooman.
2130. John Moreton Marchinton.
2157. Charles Victor Théry.
2180. Charles Ratcliffe.
2281. Robert Henry Kay, Alfred Thomas Richardson, and George Mallinson.
2315. James Fraser.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

F. Allen and T. Almgill.—Yours reached us too late for insertion in this No.

F. F.—The addresses of patentees are given under the head "Provisional Protections" when the protections are allowed. There are many difficulties in the way of carrying out your second suggestion.

Engineer.—Printed copies of all Specifications of Patents are published at the Office of the Commissioners of Patents during the seventh month after the date of the Provisional Protection. A list of those published during the preceding week, with the prices (usually but a few pence) attached, appears regularly in the *Commissioners of Patents' Journal.*

Erratum.—Last No., page 201, col. 2. line 12 from bottom, *for* "propelled by steam," *read* "propelled by screws."

CONTENTS OF THIS NUMBER.

Cunningham's Patent Improvements in Reefing Sails—(*with engravings*) 217
Perpetual Motion 220
Construction and Propulsion of Vessels.—Mr. W.B.Adams's Method of Welding the Sheets of Iron Ships, &c. 222
Preventing Explosions in Steam Boilers 224
Mawson's Portable Photographic Camera—(*with engravings*) 225
Haddan's Improvements in Cannon 226
Lane's Improvements in the Manufacture of Gold leaf 226
Levavasseur's Improvements in Lamps and Lamp Chimneys 226
The Case of J.M. Heath, the Inventor of Welding Cast Steel from British Iron. By T. Webster, M.A., &c. (*Review*) 227
The Drainage of London. A Letter, &c. By W. W. Pocock, B.A., &c. (*Review*) 228
Cort's Inventions 228
Mechanical Locomotion 230
The Smoke Question 231
A Suggestion on Railways 231

Specifications of Patents recently Filed:—

Dawson	Bedsteads, &c.	232
Mardon	Garancine	232
Allen	Vehicle	232
Hodges	Hosiery	232
Benfield	Propelling	232
Bridgewater	Tiles	232
Kirkman	Fibrous Substances	232
Whitehead	Textile Fabrics	232
Woods	Pack Saddles	232
Levavasseur	Lamps	233
Kerr	Revolvers	233
Fillier	Looms	233
Piper	Gun-stocks	233
Coles	Boots and Shoes	233
Truran	Smelting Metals	233
Hanson	Digging Potatoes	233
Mackworth	Separating Substances	233
Mellor and Young	Feeding Boilers	233
Brooman	Paper	233
Allen	Valve-gear	233

Provisional Specifications not Proceeded with:

Hunt	Bands	234
Brown	Combing Fibres	234
Hancock	Breaks	234
Thompson	Furnaces	234
Goodyear	Gunpowder	234
Goodyear	Carpet-bags	234
Effertz	Cutting Paper	234
Smith	Portable Cases	234
Abraham	Vehicles	234
Barry	Fibrous Substances	234
Hyde	Furniture-castors	234
Wilson	Folding Fabrics	235
Brownfoot	Raising Blinds	235
Willis	Wine-bottles	235
Daft	Inkstands	235
Goodyear	Floor-covers	235
Peacock & Barry	Copying Writings	235
Clunes	Pumps & Fire-engines	235
Whitehead	Furnaces	235
Colby	Taking Altitudes	235
Dalman	Glazing Earthenware	235
Dupont	Silk Fabrics	235
Clarke	Loop Fabrics	235
Vaughan	Handles for Vessels	236

Provisional Protections 236
Patents Applied for with Complete Specifications 238
Notice of Application for Prolongation of Patent 238
Notices of Intention to Proceed 238
Patents on which the Third Year's Stamp-Duty has been Paid 239
List of Sealed Patents 239
Notices to Correspondents 240

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1701.] SATURDAY, MARCH 15, 1856. [Price 3d

Edited by R. A. Brooman, 166, Fleet-street.

PASCAL'S MIXED-VAPOUR ENGINES.

Fig. 1.

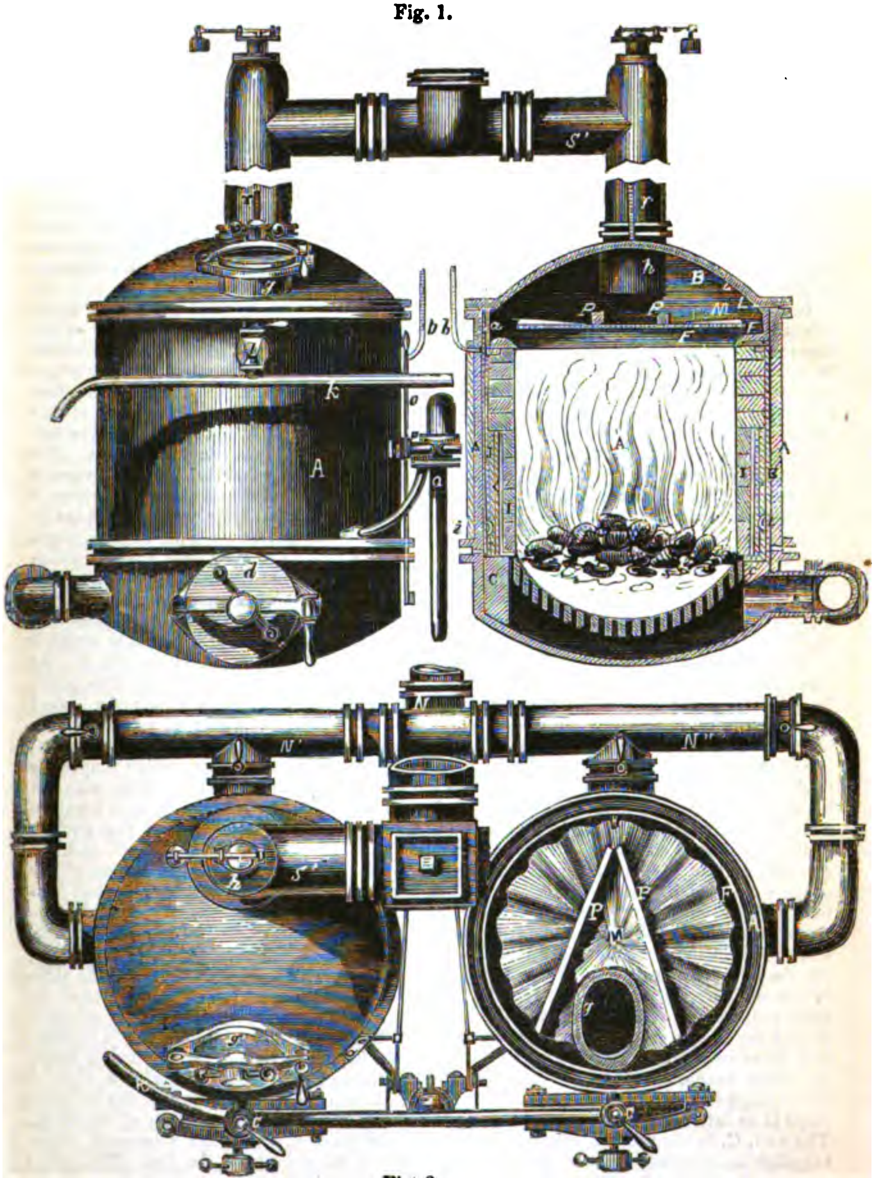


Fig. 2.

PASCAL'S MIXED-VAPOUR ENGINES.

M. Pascal, of Lyons, France, has recently introduced a number of improvements in obtaining motive power, which consist, first, in a system of generating apparatus hermetically closed, and in which combustion is effected by means of air blown either from beneath or from above the fuel, whatever may be the nature of the latter, and whatever may be the pressure existing in the generators; second, in producing inside the apparatus a mixture heated at a high temperature, and consisting of air, steam, and the gaseous products of combustion, and in generating and superheating the steam necessary to the mixture, by bringing it in contact with surfaces especially constructed for this purpose, and with superheated gases which are generated under the pressure of the mixture; third, in constructing vaporizing surfaces with metal substances connected to each other, so as they may dilate independently of one another, and thereby break the incrustations or sediments caused by the evaporation of water; fourth, in causing the expansive mixture raised to a high temperature to act as motive power in those parts of the steam engine fitted for this purpose; fifth, in distributing and varying at will, and without interrupting the work of the apparatus, such quantity of water as is necessary to generate the steam of the mixture, and consequently modify its proportions; and sixth, in causing water to drop by very small particles on the vaporizing surfaces through a capillary issue contrived round the apparatus, and of so little capaciousness as to allow a continuous current, which prevents all sediment, and leaves (as soon as the feeding ceases) the generator deprived of water.

In the engravings on the preceding page are represented two coupled generating apparatuses for obtaining a mixture of high temperature, by applying the calorific power of the furnace to heating the air which is to burn the gases, and also to heating the water which is to be converted into steam, this water being thrown in a thin sheet upon a partition plate, which divides the furnace into two parts, in the lower of which the combustion of the fuel and gases is effected, and in the upper part the mixture. Fig. 1 is an elevation of two apparatuses coupled together, one being shown in section; fig. 2 is a horizontal projection, in which one of the furnaces is shown through the line 3, 4 of the vertical projection. The inventor thus describes one of the generating apparatuses, the other being in all respects like it:—"This apparatus," says he, "consists of a cylindrical metal casing, A, which is flanched at top and bottom for being bolted to the other parts. At the upper part there is an aperture, *a*, into which a thermometer, *b*, is secured, for the purpose of exactly ascertaining the temperature of the water; there is also a flanched pipe with a cock, *l*, which opens into the blow-off pipe, *k*, for blowing out the sediments of the boiler by the vaporation of water. At the lower part there is another pipe, *f*, which is connected with the pipe for conducting the water into the apparatus. The thickness of metal of the casing, as well as that of the pieces attached thereto, depends on the temperature and pressure at which it is desired to work the engine. The semi-spherical part, B, or ash-pit, is secured on the casing, A, at the lower part by means of flanches, which are bolted together. This piece, B, has three pipes or orifices, one of which, *d*, is hermetically closed by means of a hinged lid, which is screwed down on a well faced and clean joint by means of a screw with a handle, which allows one promptly to open and shut it; the said pipe, *d*, serves for the cleaning of the ash-pit and the raking of the grate. The second pipe or orifice *m*, which is opposite to *d*, is for the air, which enters underneath the fire, and communicates by a pipe with the blowing cylinders which compress the air. All around inside the ash-box there is a wall of fire-brick, C, which supports the furnace. The third orifice, *e*, gives passage to that portion of the compressed air which is to burn the gases, and enters betwixt the wall, C, and the external wall of the ash-pit, rising subsequently for circulation round the casing of the grate, supported by cast-iron plates, I. The upper portion of the casing, A, is shut by a top lid, D, which is secured like the lower one. This lid has two orifices or pipe ends projecting into the inside of the apparatus; one of these, *g*, is for feeding fuel into the furnace, and is shut in the same manner as that of the ash-pit; the other pipe end, *h*, is for letting out the mixture of gases and of steam, and joins the steam pipe, S', which leads to the slide of the engine. In the inside of the casing, A, is a second cylinder, E, which has at its lower extremity an external flanch, which is held fast between the flanches of the ash-box, B, and the casing, A. The space between E and the casing, A, is only about one twenty-fifth of an inch for the passage of the water coming from a groove, *i*; this groove is above the lower flanch, all round the cylinder, at the same height as the centre of the pipe, *f*, which brings the water into the annular capacity, I, and at the upper part of the cylinder there is an internal flanch for receiving the ring or hoop, which is made up of segments. The wall, C, in the ash-box carries the grate of the furnace, which has a concave shape, lengthening out towards the orifice, *d*, for facilitating the poking of the fire. This grate consists of bent bars, which rest on the cast-iron plates with which the wall, C, is coped.

On this wall and upon the grate-bars are placed the segmental or circular bricks, or pieces of cast-iron, I, which form the sides of the furnace. The compressed air for burning the gases circulates round these segments, and is there thoroughly heated; also not to lose any heat which might easily pass off through conducting substances such as the cylinder, A, is made of, the air is separated from the said cylinder by hollow cast-iron bricks, J, the inside or cavities of which are filled up with fire clay. From the segments, I, up to the flanch of the cylinder, E, the sides of the furnace are made of fire-bricks, that are supported by the cast-iron bricks, I, joining the inside of the cylinder, E, in such a manner as to leave a passage, *e*, for the air, which rises into the upper portion of the furnace after having been heated around it. The segmental crown, F, rests upon the bricks of the fire-box, and upon the upper flanch of the cylinder, E, to which it is slackly fixed, so as to prevent it from turning, and yet not to impede expansion. One of those segments has a pipe end, which is a continuation of the pipe, *g*, on the lid, D, for feeding the grate. The said crown is made up of segments or annular sectors in order to let the expansion act freely. Upon the crown, F, there is a cast-iron hoop, L, which is separated from the casing by a small interval, which forms, as it were, an extension of the cylinder, E, and this interval receives the portion of the water which does not evaporate by passing through the joints of the cylinder with the hoop, F, at the same time sheltering the casing, A, from the action of the flame. On the crown the partition-plate, M, is placed for separating the furnace, A′, from the chamber, D, where the mixture of the steam and the gases of combustion is effected. This partition consists of a series of sheet-iron bands stayed together by the bars, P P, in such a manner as to be capable of sliding over one another, when by the effect of heat they expand or contract, still continuing to form a closed partition. This partition has a hole cut out, and corresponding to the orifice for feeding the furnace; its central part is even, whilst the edges are undulating, so as to form grooves, which diminish from the edges towards the centre."

The inventor next describes the manner in which this engine is worked as follows:— "The fire having been lighted, and the lids of the orifices, *g* and *d*, closed, the air from the blowing engine enters the ash-box through the orifice, *m*, passes between the bars of the grate and forces the combustion, thus generating various gases and smoke, that tend to escape between the hoop, F, and the undulated edges of the plate or partition, M; at the same time the compressed air which enters by the pipe, *e*, circulates round the furnace; being thus powerfully heated, and passing next into the duct, I, forcibly rushes against the under surface of the plate, M, there to combine with the gases and the smoke, which it burns by supplying them with its oxygen, under the high temperature of the furnace, which overheats the plate, M. This combustion being thus effected, the gaseous products escape betwixt the crown, F, and the undulated edge of the plate, M, where they meet another obstacle. The water which is forced into the groove or channel, *i*, by the pump of the engine rises, and forms between the cylinder, E, and the casing, A, a liquid cylinder; it then passes between the hoop, L, and the segmental hoop, F, so as to undergo a powerful ebullition on said segments, one portion of the water being at once converted into steam, and the other being projected upon the red-hot plate, M, where it divides into spheroidal globules. This projection is facilitated by the passage of the gases between the segments and the plate, M, which tend to get into the cap, thus breaking up the globules, and causing them to be instantaneously converted into steam that forms the mixture. For ascertaining the temperature of the mixture, a thermometer, *r*, is placed on the cap, D, and the temperature of the water when it reaches the red-hot surface is shown by the elbowed thermometer.

"From the preceding description," continues M. Pascal, "it is obvious that by this system of apparatus a mixture of superheated steam and the gaseous products of combustion is obtained in a hermetically closed furnace under the pressure of said gases and at a high temperature. The mixture, in order to act as motive power, passes into the pipe, *h*, which carries a safety valve that is loaded with a weight corresponding to the pressure which it is desired to work at; from there it passes into the cylinders of the engine, if used as a motive power, or into proper warming ducts, if used for heating. The engravings show the coupled apparatus. The single pipe, N, which leads the compressed air from the blowing engine to the generating apparatus, divides into two pipes, N′, N″; the passage of air may be intercepted in either of these branches by means of slides, which are moved by levers, *l*, *l′*, that are within reach of the engine driver. The pipes, N′, N″, lead the air to the orifices, *m*, *m*, and *e*, *e*, of each of the apparatus, and its admission may be regulated or stopped by means of valves. The water gets into the apparatus by means of a single tube, Q, which ends in the double cock, R, the seat of which carries an exit pipe for the water from the pump which does not enter the generating apparatus. The keys of these valves are operated by levers, thus allowing the machine driver at the same time to shut off and

let in both water and air. The plugs of these cocks are constructed in a particular manner, so as to allow shutting by one stroke, and opening by one stroke too, always suiting the influx of water to the requirements of the work. The pipe, S', unites the pipes, H, H, that conduct the motive agent into the engine; each of these pipes has a clack valve, which open towards the pipe, S. When one of the generators is stopped, and when the blow-off cock is opened, the mixture acting with a great pressure escapes, and carries away all that might have been collecting upon the plate, M, such as the scalings, which may fall off by expansion and cooling. The pressure of the other apparatus working alone, will suffice to shut the communication clack valve, and keep it shut. The said clack valves may be worked also by mechanical means. A pipe with cocks is for running out the water contained between the cylinder, E, and the casing, A, when the apparatus is quite stopped."

FARADAY'S EXPERIMENTAL RESEARCHES IN ELECTRICITY.

(*Continued from page* 199.)

The next "Series" of these Researches (the 23rd) is "On the Polar or other Condition of Diamagnetic Bodies." We shall extract only a few passages from this series, as only negative results were obtained.

"(2640.) Four years ago I suggested that all the phenomena presented by diamagnetic bodies, when subjected to the forces in the magnetic field, might be accounted for by assuming that they then possessed a polarity the same in kind as, but the reverse in direction of, that acquired by iron, nickel, and ordinary magnetic bodies under the same circumstances. (2429, 2430). This view was received so favourably by Plücker, Reich, and others, and above all by W. Weber, that I had great hope it would be confirmed; and though certain experiments of my own (2497) did not increase that hope, still my desire and expectation were in that direction.

"(2641.) Whether bismuth, copper, phosphorus, &c., when in the magnetic field, are polar or not, is however an exceedingly important question; and very essential and great differences, in the mode of action of these bodies under the one view or the other, must be conceived to exist. I found that in every endeavour to proceed by induction of experiment, from that which is known in this department of science to the unknown, so much uncertainty, hesitation, and discomfort arose from the unsettled state of my mind on this point, that I determined, if possible, to arrive at some experimental proof either one way or the other. This was the more needful, because of the conclusion in the affirmative to which Weber had come in his very philosophical paper; and so important do I think it for the progress of science, that in those imperfectly developed regions of knowledge, which form its boundaries, our conclusions and deductions should not go far beyond, or, at all events, not aside from the results of experiment (except as suppositions), that I do not hesitate to lay my present labours, though they arrive at a negative result, before the Royal Society."

After describing a peculiar apparatus contrived for the purpose of testing this point, and narrating several experiments with it (some of which we should be glad to give had we more room), he comes to the following conclusion.

"(2693.) Finally I am obliged to say, that I can find no experimental evidence to support the hypothetical view of diamagnetic polarity, either in my own experiments, or in the repetition of those of Weber, Reich, or others. I do not say that such a polarity does not exist; and I should think it possible that Weber, by far more delicate apparatus than mine, had obtained a trace of it, were it not that then also he would have certainly met with the far more powerful effects produced by copper, gold, silver, and the better conducting diamagnetics.

"(2694.) So, at present, the actions represented or typified by iron, by copper, and by bismuth, remain distinct; and their relations are only in part made known to us. It cannot be doubted that a larger and simpler law of action than any we are yet acquainted with will hereafter be discovered, which shall include all these actions at once; and the beauty of Weber's suggestion in this respect was the chief inducement to me to endeavour to establish it."

The inquiry was subsequently undertaken by Professor Tyndall, who published a paper "On the Polarity of Bismuth," in the *Philosophical Magazine* for November, 1851; in which he comes to an opinion favourable to the views of Weber, Reich, and Plücker, but not a very decided one. The difference of opinion thus produced has led to a review of the nature of what has hitherto been called "Polarity," and the discussion has done good by showing the vague and unsatisfactory nature of the ideas formerly accepted on this subject. Faraday has several remarks on these later researches and discussions in a subsequent portion of

the volume before us, to which we hope to devote some attention on a future page.

The next "Series" (the 24th) is "on the possible relation of gravity to electricity." As might be expected, no satisfactory results were obtained by this inquiry, in which we again perceive the want of clear mechanical views and mathematical training.

The 25th Series is "On the Magnetic and Diamagnetic Condition of Bodies; including (1). Non-expansion of gaseous bodies by magnetic force. (2). Differential magnetic action. (3). Magnetic characters of oxygen nitrogen, and space." With regard to the first of these points, on the expansion of gases by magnetism, we have to repeat our last remark, and to regret that Faraday should not possess *that* knowledge which would so greatly enhance the rest of his knowledge, and prevent his wasting such valuable time on subjects in which the above-named deficiency renders his labours fruitless. Paragraph (2721), which contains the grounds on which his present inquiry was based, is full of unsound and vague notions.

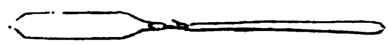
The investigation of "Differential Magnetic Action" is more instructive; but the experiments described under the third head, "Magnetic characters of oxygen, nitrogen," &c., are the most valuable and interesting in this "Series."

"(2770.) The differential action of two portions of gas, or of any two bodies, may, by a more elaborate method, be examined in a manner far more interesting and important than that just described. The mode of action referred to may even be made the basis of instruments by which probably most important indications and measurements of both magnetic and diamagnetic actions may be obtained, leading to results which are not even as yet contemplated by the imagination.

"(2771.) If two portions of matter, gaseous or liquid, are tied together and placed in a symmetric magnetic field, on opposite sides of the magnetic axis, they will be simultaneously affected. If both are diamagnetic, or less magnetic than the medium occupying the magnetic field, both will tend to go outwards or equatorially; equally if they are alike, but unequally if they differ. The consequence will be, that if they are placed in the first instance equidistant from the magnetic axis, the supervention of the magnetic force will not alter their position, provided they be alike; but if they differ, then their position will be changed; for the most diamagnetic will move outwards, equatorially, pulling the least diamagnetic inwards until the two are in such new positions that the forces acting on them are equipoised, and they will assume a position of stable equilibrium. Now the distance through which they will move may be used indirectly; or, better still, the force required to restore them to their equidistant position may be employed directly to estimate the tendency each had to go from the magnetic axis; that is, to give their relative diamagnetic intensities.

"(2772.) That I might submit gases to such a method of examination, I selected a piece of very thin and regular flint glass tube, about five-sixteenths of an inch external diameter, and not more than one-sixtieth of an inch in thickness, and drawing at the blow-pipe lamp two equable portions of this tube into the shape and size represented, fig. 7, in which the barrel part

Fig. 7.



is 1½ inch long, I filled one with oxygen gas, and the other with nitrogen gas, and then sealed them up hermetically. The end of the prolonged part of each was touched whilst warm with sealing-wax and a thread fastened to it, which thread was tied into a loop, also represented of full size. By these the tubes were to be suspended perpendicularly from a torsion balance, so that the middle of each should, when in place, be on a level with the magnetic axis.

"(2773.) The torsion balance consisted of a bundle of sixty equally-stretched cocoon silk fibres, made fast above to a vertical axis carrying a horizontal index and graduated plate, and below to a horizontal lever. A cross-bar, about 1½ inch long, was attached to one end of this lever, also in the horizontal plane; and on the extremities of this cross-bar, and 8½ inches from the centre of motion, were hung the two tubes of oxygen and nitrogen, counterbalanced by a weight on the other arm of the horizontal lever. The whole was thus so placed and adjusted in relation to the electro-magnet, furnished at the time with the double-cone core or keeper (2764) that the middle part of each tube was level with the middle of the core, and equidistant on each side from it. Under these circumstances, if any motion was given to the balance, so as to make its arm vibrate, the vibrations were made with great slowness, in consequence of the weight of the whole moving arrangement, and the small amount of torsion force in the cocoon silk.

"(2774.) The moment the magnetic force was thrown into action all things changed. The oxygen tube was immediately carried inwards towards the axis, and the nitrogen tube driven outwards on the contrary side.

The balance swung beyond its new place of rest and then returned with considerable power, vibrating many times in the period which before was filled by a single oscillation; and when it had come to its place of rest, or of stable equilibrium, the oxygen tube was about one-eighth of an inch from the iron of the core, and the nitrogen tube four-eighths distant. Ten revolutions of the torsion axis altered only in a slight degree these relative distances.

"(2775.) The actions which determine the mutual self-adjustment of the oxygen and nitrogen, as regards their place in relation to the magnetic axis, are very simple and evident. In the first place, the *glass* of the tube is more diamagnetic than the surrounding medium or air (2424), and therefore each tends to move outward; but being equal in nature and condition to each other, they tend to move with equal force when at equal distances, and at those distances compensate each other. If one be driven inwards, it is subjected to a greater exertion of force by coming into a more intense part of the magnetic field; and the other being at the same time carried outwards, is for a corresponding reason, in a place of less intense action; and, therefore, as soon as the constraint is removed, the system returns to its position of stable equilibrium, in which the two bodies are equidistant from the magnetic axis.

"(2776.) The *contents* also of the tubes are subject to the magnetic forces, and as the result shows (2774) in very different degrees. Either the oxygen tends inwards much more forcibly than the nitrogen, or the nitrogen tends outwards more powerfully than the oxygen; and the difference must exist to a very great degree, for it is such as to carry the glass of the oxygen tube up to a position so near the axis that it could not by itself, or with mere air inside, retain it for a moment without the aid of considerable restraint. The power with which the tubes only would retain their equidistant position, combined with the extent to which they are displaced from this position, shows the great amount of force which this conjoint action of the oxygen and nitrogen leaves free to be exerted in the one direction, namely, from the oxygen, inwards or axially, for though the action be complicated, the result is simple. By former experiments, the nitrogen is known to pass equatorially, and the oxygen axially in air (*Philosophical Magazine*, 1847, vol. xxxi., p. 409), and the nitrogen tube will pass equatorially according to a certain differential force, depending on the flint-glass, and the nitrogen on the one hand, and the bulk of air displaced by them on the other. The oxygen tube, in like manner, will tend to pass axially by a differential force, the amount of which will depend upon the tendency of the oxygen to go axially, of its tube to go equatorially, and of their joint relation to the air they displace. But both the tubes and their contents are by their joint relation to the air and their mechanical connection so related to each other, that when a force (as of torsion), is employed to restore them to their equidistant position from the magnetic axis, all consideration of the matter of the tubes and of air as a surrounding medium may be dismissed. The gases within them may be considered as in immediate relation with each other and the magnetic axis, and disembarrassed from all other actions; and the force which may be found needful to place them *equidistant*, is the measure of their magnetic or diamagnetic difference.

"(2777.) Having thus explained the general principles of action, I will not at present go into their application in the construction of a measuring instrument, or the results obtained with it, further than is required for the general elucidation of magnetic and diamagnetic bodies, and the determination of the true zero point.

"(2778.) The principles just described enabled me to return to a method of investigation which on a former occasion greatly excited my hopes (2433), but which seemed then suddenly cut off by want of power. Various bodies, whether considered as magnetic or diamagnetic substances, admit of two modes of treatment, which promise to be exceedingly instructive as regards their properties and their destined purposes in natural operation. A gas may be *heated* or *cooled*, and the effect of temperature, which is known to be very influential (*Philosophical Magazine*, 1847, vol. xxxi., pp. 406—417), may now be ascertained without any change in the bulk of the gas; or it may be *rarefied* and *condensed* through a very extensive range, and the effect of this kind of change upon it, ascertained independent of temperature or the presence of any other substance. Solids and liquids do not admit of these methods of examination, and do not therefore assist in the determination of the zero point and of the true distinction of magnetic and diamagnetic bodies in the same manner that the gases do.

"(2779.) It appeared to me, that if a gaseous body were magnetic, then its magnetic properties ought to be diminished in proportion as it was rarefied; that is, that equal volumes of such a gas, at different pressures, ought to be more magnetic as they are denser; on the other hand, that if a gas were diamagnetic, rarefaction ought to diminish its diamagnetic character, until,

when reduced to the condition of a vacuum, it should disappear. In other words, if two opposed portions of the same magnetic gas, one rarer than the other, were subjected at once to the magnetic force, the *denser* ought to approach the axial line, or be drawn into the place of most intense action; whereas, if two similarly opposed portions of a diamagnetic gas were subjected to the magnetic action, the more expanded or *rarer* gas ought to go inwards to the place of strongest action.

"(2780.) Several bulbs of oxygen (fig. 8),

Fig. 8.

similar in arrangement to those already described (2772), and very nearly alike in size, were prepared and hermetically sealed, after that the quantity of gas within them had been reduced to a certain degree by the air-pump. The first contained the gas at the pressure of one atmosphere; the second had the gas at half an atmosphere, or 15 inches of mercury; the third contained gas at the pressure of 10 inches of mercury; and the fourth, after being filled with oxygen, was reduced to as good a vacuum as an excellent air-pump could effect. When the first of these was compared with the other three, the effect was most striking; opposed to the half atmosphere, it went towards the axis, driving the expanded portion away; when in relation to the one-third atmosphere, it went inwards or axially with still more power; and when opposed to the oxygen vacuum, it took its place as close to the iron core as in the former case, when contrasted with nitrogen (2774), and it was manifest that the diamagnetic power of the glass tube which inclosed it was the only thing which prevented the oxygen from pressing against the iron core occupying the centre of the magnetic field.

"(2781.) On experimenting with the other tubes, exactly the same result was obtained. Thus the tube with one-third of an atmosphere, in association with the vacuum tube, went inwards, driving the other outwards; that is, it was more magnetic than the vacuum: but in association with the one-half atmosphere tube it went outwards, whilst the denser gas passed inwards. Any one of the tubes, if associated with another having a rarer atmosphere, passed inwards or magnetically, whilst if associated with others having denser atmosphere, it passed outwards, being driven off by the superior magnetic force of the denser gas. As far as I could ascertain in these preliminary forms of experiment, the tendency inwards or axially appeared to be in proportion to the density of the gas; but the exact measurement of these forces will be given hereafter.

"(2782.) Thus oxygen appears to be a very magnetic substance, for it passes axially, or from weaker to stronger places of force, with considerable power; a conclusion in accordance with the result of former observations. (*Phil. Mag.*, 1847, vol. xxxi., pp. 410—415.) * * * No doubt it may be said that dense oxygen is less diamagnetic than rare oxygen or a vacuum. This, however, would imply that the acting force of a substance, as the oxygen, could increase in proportion as the quantity of the substance diminished, which is not, I think, a philosophical assumption; and besides that, other reasons will soon appear to show that the magnetic condition which disappears as the oxygen is removed, belongs to and is dependent upon that substance, and that oxygen is therefore a truly magnetic body."

We may observe, in passing, that these experiments, although just stated by Faraday to be in accordance with former ones described in the *Philosophical Magazine* for 1847, are in opposition to, or rather perhaps *corrective*, of those still earlier experiments described in the 21st series of these researches, in which "in every kind of trial, and in every form of experiment, the gases and vapours were found to occupy a medium position between the magnetic and diamagnetic classes." (See § 2416 quoted at page 56 of our Magazine. See also § 2432, &c., quoted at page 101.) Faraday usually adds references to his former researches when these are corrected or altered by newer experiments, but in this instance he has not done so.

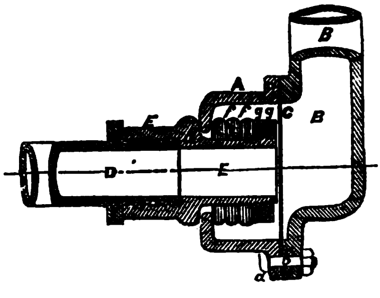
(*To be continued.*)

FLEXIBLE JOINTS FOR LOCOMOTIVE FEED-PIPES.

A very effective method of jointing the feed-pipes of locomotives has recently been patented, and is now in use on the Lancashire and Yorkshire Railway, where it gives entire satisfaction to the Locomotive Superintendent and other officials. It is the invention of a distinguished surgeon (to whom it was suggested by a study of the action of the spine, &c.) but Mr. Lingard, engineer, of Manchester, is working the patent which has been obtained for it.

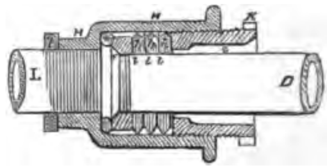
Fig. 1, of the accompanying engravings, is a section of the patent flexible joint when at rest. Fig. 2 is the junction joint for connecting the pipes of the locomotive and tender. The joint shown in fig. 1 is supposed to be in the place at which the pipe dropped from the tender joins the pipe leading direct to the engine, where considerable flexibility is required, at the same time that a water-tight joint is necessary. To obtain flexibility and at the same time secure the durability and strength of metal piping, advantage has been taken of the elasticity of India-rubber by a method which allows great freedom of action, but which renders the escape of water impossible. The India-rubber, being acted upon by *compression*, and also being kept constantly moist and protected from all external injurious influences, works under the most advantageous circumstances. A A is a cup, having a flange, *a*, bolted to the flange of the pipe, B B, by means of the bolts, *b*, a water-tight joint being most conveniently effected by an India-rubber ring, C C, placed between the flange of the cup and the flange of the pipe. The cup A has a hole in it large enough to allow the piece E, which is put through it, to move in any direction required. The pipe D, leading to the engine, has the end piece E screwed upon it, and it is secured in its place and prevented from leaking by a lock nut, C. (This arrangement makes the first putting together simple, and repairs easy, as the screw on the pipe is the regular gas-thread in constant use, but, if preferred, Railway Companies can be supplied with the end pieces made so that the pipe D can be soldered or otherwise fastened in, to suit their own convenience.) The end piece E is made with a shoulder, *d*, which beds against the face of the cup A; it afterwards passes through the hole in the cup A, and has upon it India-rubber rings, *e*, and metallic washers, *f*, placed alternately. These rings and washers are secured in their places, and the cup A and the pipe D are made fast to each other, by two lock nuts, *g g*, screwed upon the piece E. Unless acted upon by some external force, the cup A and the pipe D will always be in a straight line, but if the pipe is pushed in any direction the shoulder *d* on the outside of the cup A becomes a fulcrum upon which the whole moves, and the India-rubber is compressed on one side, thus allowing the amount of flexibility required, and rendering the joint, if possible, more secure, by causing the India-rubber to clip the pipe more tightly.

Fig. 1.



For coupling the engine and tender together, instead of employing the joint now in general use, the joint shown in fig. 2, which is easily coupled up, and at the same time flexible, is substituted. D is the other portion of the pipe leading to the engine, having a collar, F, firmly fastened on the end. It has also a series of India-rubber rings, *h*, and metallic washers, *i*, upon it, and beyond them a loose piece, G, screwed on the outside, and having a notched head *k*. This notched head is fitted by a screw key, for the purpose of turning it round and screwing it into its place. The various parts just described are all upon the pipe D, in connection with the tender; and when it is desired to couple the pipes of the engine and tender together, the end of the pipe D and the collar, &c., already mentioned, are put into the cup H, which is screwed on to the feed-pipe L of the locomotive, and fastened by the lock nut *l*. The cup H is screwed in the inside to admit the loose piece G, and has an India-rubber washer *m* at the front end, against which the collar F is pressed, by screwing up the loose piece G, and at the same time the other India-rubber rings, *h h h*, are compressed, and made to fit the pipe, and to fill up the cup H, so as to prevent the escape of water. The pipe D is free to move in the loose piece G, and if pushed in any direction, the elasticity of the India-rubber rings allows it to be deflected, as in the former case.

Fig. 2.



By means of this junction joint, the feed-pipes of the engine and tender may be coupled up or detached at pleasure, and as all the joints are made identically alike, the tender of one engine may be connected

with any other when required. The set of joints described are for the pump on one side of the engine, and a duplicate set are used for the pump on the other side.

The advantages which these joints possess over the ball and socket and telescope tube so generally used, and also over the common hose pipe now employed upon some lines of railway, are stated as follows by Mr. Lingard.

"With regard to the ball and socket and telescope tube, it is well known that the joints must either be tightened up so as to be nearly rigid, to prevent the escape of water, or allowed to leak to admit of the required freedom of action, and leakage being a less evil than breakage, it will be noticed that in almost every instance the locomotive feed-pipes do leak.

"Again, the wear of the present joints is very rapid, in consequence of dust and grit getting between the metallic surfaces, and grinding them away, and both to make and to keep in order, they require the very best fitting and the most judicious management.

"With the joint now brought forward leakage is impossible, in proof of which it may be stated that several joints selected indiscriminately, and without any preparation for the test, have for a considerable time stood a pressure of 112 lbs. per square inch, the pipe being constantly deflected, without the escape of a drop of water, or any diminution of the flexibility of the joint; in fact, as may be seen from the construction, the effect of pressure tends to render the joint more secure. The construction and repairs of the new joint are of the most simple kind, as no fitting is required in the making, and the repairs are limited to renewing the India-rubber rings, the lasting qualities of which are not at present known, the oldest joints now in use having been at work nearly six months without any apparent deterioration.

"All the parts are well protected and easily got at when necessary, and by the engine drivers who have hitherto used them they are much preferred to any joint that has so far been tried.

"The advantages over the hose-pipe are, greater durability and less expense in repairs, and all the exposed parts being of metal, the iability to cutting or external damage is obviated, at the same time that a clear waterway is ensured, and a water-tight junction between the engine and tender feed-pipes quickly and easily obtained."

It should be observed that, the use of the improved joints is not limited to locomotive feed-pipes.

THE CAUSES OF EXPLOSIONS OF STEAM BOILERS;

AND MR. W. K. HALL'S METHOD OF PREVENTING THEM.

A paper on the causes of explosions of steam boilers was read on the evening of March 4, 1856, at the Institution of Civil Engineers, by Mr. William Kemble Hall, of the United States, R. Stephenson, Esq., M.P., presiding on the occasion. The following is a summary of the author's remarks, and of the discussion which followed them:

It is reasonable to suppose that the tearing of the boiler into several pieces, which generally accompanies explosions, is caused by a sudden exertion of power, and electricity has been suggested as an agent. But although electrical phenomena may be exhibited by the expansion of a jet of steam, it cannot be supposed that a boiler, with its many direct and metallic connections with the earth, can be converted into a reservoir of electricity. If any were generated, it would be instantly conducted away. It has been supposed that the plates exposed to the action of the fire by the falling of the water have become overheated and decomposed the steam, the oxygen of which has combined with the iron, and the hydrogen formed a gas that has caused the explosion. But hydrogen will not explode, unless largely mixed with atmospheric air, which cannot enter the boiler except in minute quantities, forced through the feed-pump, in combination with water; and although there is evidence of the absorption of oxygen, in the rusting of the stays and of the interior surface of old boilers, it is too insufficient in extent to warrant the deduction that there has been an appreciable change in the chemical composition of the steam. It may be possible to produce an external explosion, but not an internal one.

In the explosion at the Consett Ironworks, Gateshead, early in November, it is in evidence that the boiler had been blown out a short time previous, and the valve was not closed. The plates had been heated red hot; and it was supposed that the attendant, who was killed, had discovered the deficiency of water, and had just opened the feed-valve at the instant when the explosion occurred. Now heat did not lessen the strength of iron up to the temperature of 550°; and had it exceeded that point in this case, and thus weakened the boiler, the result would merely have been a collapse of the flue. Water is not resolved quickly into steam by a red hot surface. The excessive heat repels the par-

ticles, and they are slowly evaporated by the communication of heat through the intervening vapour. No great pressure, therefore, could have been generated directly from this source. When heat is applied to steam, the increase of its pressure is governed by the same law that applies to air and all other elastic gases, an addition of 480° only doubling its pressure. Experiments have conclusively proved the possibility of heating steam in contact with water without also increasing the temperature of the bulk of the water, the upper stratum of which alone become heated by the contact. If therefore it is supposed, for example, that the steam has been heated to 435° Fahr., and water suddenly injected into it, the pressure would have been instantly raised to that due to the presence of the water—determined by the experiments of Arago and Dulong to be 360 lbs. per square inch at that temperature. Or, to use another illustration, while 1000° of heat applied to steam would but increase its pressure or volume about threefold, the same amount would multiply that of water 1700 times. This vast increase would certainly be modified by the latent heat absorbed by the water in its conversion into steam, but serves to indicate a sudden and local generation of excessive pressure, which might result in explosion.

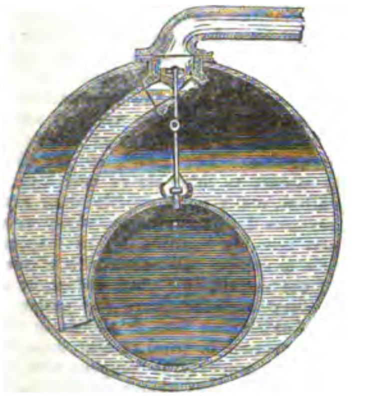
The surcharged steam may be supplied with water, without the agency of the feed pump. At the explosion which occurred at Chiswick, July 16th, when the safety valve was in good order, and loaded to the average working pressure of 20 lbs. to the square inch, the boiler had been idle during the dinner hour, and the explosion occurred as the engine man was in the act of opening the stop valve, preparatory to starting the engine. The water had probably been low, and the sudden flow of steam into the pipes partially relieved the water of pressure, and it was thrown by the agitation into intimate contact with the superheated steam, and suddenly converted into vapour of too high a tension for the strength of the boiler. It is a well-known fact, to those conversant with the practical management of steam boilers, that the water stands higher, when the engine is in operation, than when it is idle, and that it may be further raised by opening the safety-valve. This effect is more apparent with a contracted water surface, and comparatively small steam room. An explosion which took place at the Tower Mills, Sheffield, August 11th, is an illustration. The surviving attendants positively affirmed, that observations of the water-gauges, a few minutes previous to the accident, showed sufficient water; but an engineer, deputed by the coroner for the purpose, examined the boiler, and testified that it had been over-heated and that such indication was wrong, or had been misunderstood. The boiler exploded immediately after the attendant had made some preparation necessary for opening the safety valve, and probably at the instant he had opened it. The boilers that exploded at the Walker Iron Works, at Newcastle, October 8th, and at the Kebblesworth Colliery, September 19th, were each provided with a float and two safety valves. In both instances there was reason to believe that the water had been forced through the connecting feed pipe, from the boiler that exploded, into the adjoining one, and that in the latter instance, the attendant had observed the danger, and was engaged in opening the safety-valve.

Experience has proved that the fusible metal plug, enjoined by law in France, becomes encrusted by scale, and otherwise rendered inoperative by use, and does not answer the purpose for which it was intended. The softer portions of a compound metal are forced out by the pressure to which it is subjected, and the remainder becoming oxidised, does not fuse at the temperature intended. It, moreover, acts merely as a warning, and does not serve to obviate the impending catastrophe.

All the contrivances hitherto adopted for the purpose of providing against explosions, were designed to supply water, when that in the boiler had fallen to too low a level, or to open the safety-valve by the pressure of steam, independent of other circumstances. As has been illustrated by the examples alluded to, either of these plans would induce, in many instances, the very accident designed to be avoided. For there seems every reason to believe, that the great majority of explosions are occasioned by the negligence of the attendant, in permitting the level of the water to fall below the flues, exposing the plates to a high temperature, and surcharging the steam with caloric, far exceeding that due to its pressure. In injecting an additional supply of water into the boiler, when in this dangerous condition, it is thrown over the heated plates and into the super-heated steam, and suddenly converted into steam of too high a tension for the boiler; and so instantaneously, moreover, that it operates with all the momentum of a blow. And as the water necessary to produce this disastrous result may be supplied to the surcharged steam, from that already in the boiler, by the agitation incident to the opening of the, so-called, safety-valve, the alarming fact is presented, that the very

instrument provided for insuring against explosions may become the cause of producing one.

These considerations naturally lead to the conclusion that safety is alone to be attained by opening a water blow-off valve, when the surface of the water has fallen to a perilous extent, for the purpose of first discharging from the boiler the water, which is the more dangerous element, and then the steam; operating, in fact, as a safety-valve, in a more useful but less objectionable position than the present steam valve situated on the dome. The arrangement represented by the accompanying wood-cut illustrates the principle; it represents a



valve communicating with the water, and kept in position by a rod which serves for its stem, and terminates in a button cemented with tin, or other readily fusible metal, into a copper cup, riveted to the crown of the furnace. There are no working joints, or stuffing boxes, to become disordered, and the fusible metal is protected by the cup, composed of a material which is a rapid conductor of heat. If the furnace should be unduly heated, the button would be released, and the valve permitted to open and discharge the water and steam from the boiler. The boiler might be injured, and the flues destroyed by the fire, but no explosion could occur. This system has been subjected to trial under heavy pressure, and has been found very successful.

In the discussion, it was argued that Mr. Hall's system, if properly carried out, would be extremely useful, and almost prevent the possibility of danger from explosion; but that it would only be of use when an explosion was almost inevitable, and that as prevention was better than cure, the utmost should first be done to prevent boilers reaching that state, still retaining Mr. Hall's valuable apparatus, in cases of all other means of prevention proving ineffectual. The majority of explosions were stated to arise from the practice of constructing the boilers with the fire-places in the flues, contrary to the system used in Cornwall, where they always arranged to have abundant boiler room and slow combustion; but where flue firing was used, the boiler surface was too frequently deficient, and the firing rapid and generally forced. Plans were exhibited, showing this peculiar danger to be caused by the severest action of the fire being, of necessity, within the concavity of the fire flue, upon which there was but a few inches depth of water, and where the least neglect in its supply would be fatal to the boiler plate, even if a repulsive action did not already cause a remittant rather than a constant action of contact of water with the plate; besides which, the probability of the water below the fire bars not boiling at all, rendered the supply of steam weak, and easily exhausted, and led to undue firing and all its concomitant evils. A furnace constructed of masonry was described as promoting the reverse of all these conditions. Many extracts from known writers, bearing on the subject, were given, and it was attempted to be shown that while there were fully as many under-firing as tube-firing boilers at work, the majority of explosions took place in boilers of the latter class, and they almost invariably commenced with the collapse of the fire flue.

It was contended that the only objection which could be raised against under-firing was the danger of incrustation or deposit upon the boiler bottom of matter held in suspension by the water; but that this rarely if ever caused explosions: the utmost injury it occasioned was causing the boiler plate to be burnt out, and that this effect could not take place without gross neglect. The questions of the possibility of saturating surcharged steam so as to dangerously increase its power; of hydrogen gas being formed in the boiler, and other theories of a similar nature were avoided, as it was held that each of these, supposing their possibility, must arise from the presence of unduly heated metal within the boiler, which it could not be doubted was the prime cause of nearly all explosions, and that a properly set under-firing boiler could never, except from the most culpable neglect, have any portion of its surface overheated. It was also suggested that when it was necessary to stop the engines, instead of closing the damper, it would be safer to leave it open, to close the ash-pit door, and to keep the fire-door ajar.

The possibility of the water being re-

pelled from the top of the flue, in the case of internal flue firing, was contested, and it was argued that the water would rather have a tendency to rise up the two sides of the tube, on account of the fire being in immediate contact with the side plates, and thus that the two currents would cause the water rather to heap up over the flue.

Many flue boilers were injured by the flame being allowed to impinge too sharply upon certain parts, and in those spots the plates blistered, and were soon burned through; the best remedy for this was to give more flue space; and it would be found that the quantity of steam generated would be increased, whilst the burning of the boiler would be prevented. In many cases of explosion, especially of locomotive boilers, it was evident that the pressure had increased very gradually, and the steam had become surcharged with heat, so that when the explosion occurred all the water was suddenly flashed into steam, as the rails and ground all around were quite dry.

It was doubted whether the fusible metal might not, in practice, become partially fused, at a comparatively low temperature, and allow the valve to open prematurely; and it was urged that it was safer to depend upon the care, skill, and intelligence of the engineman, than upon any self-acting apparatus. Many serious accidents, particularly on railways, had arisen from the attendants being lulled into fancied security by having self-acting points, or other apparatus, which worked well for a time, until something went wrong, and then an accident ensued.

The flues frequently collapsed in consequence of their losing their circular shape by pressure, or from originally imperfect construction.

The spheroidal theory of M. Boutigny (D'Evreux) was discussed, and a doubt was expressed, whether any considerable quantity of water could be brought into the same state as the small quantities upon which his experiments were tried. It was, however, contended that if a boiler was heated to a very high temperature whilst empty, and the water was then suddenly injected and the aperture closed, an explosion would not occur instantly, because the water would have assumed the spheroidal state; but as soon as the temperature was reduced to the proper degree, the steam would be liberated in such a volume and at such a density as to burst the boiler.

In Cornwall, where it was acknowledged that the utmost economy of fuel was practised, the boilers were stated to be nearly all on the internal flue principle, and an accident was scarcely ever known to occur there. It was generally admitted that the apparatus introduced by Mr. Hall would be effective in preventing accidents, but that the main point was to have very ample boiler space, have no self-acting apparatus, and encourage great attention on the part of the engine attendant.

THE NEW METAL, ALUMINIUM.

Much attention has been excited upon the subject of the metal aluminium, and we perceive that many applications for patents connected with its use have been made. The ideas which originate these patents are, of course, based upon the presumed properties of the metal as detailed to us by the French chemists, with an additional colouring gained from the imagination of the inventor. It is superfluous to say that, under such circumstances, the results are but little likely to justify the expectations of the patentees; hence a few words of advice upon the subject may prove of use to the over-sanguine. The metal, so far from being almost as infusible as cast iron, or even silver, melts more readily than zinc, and remains fluid upon a piece of dry wood, without sensibly burning it, as happens with tin or solder. It unites with scarcely any of the metals, and when united, in almost every instance loses its power of resisting oxidation; thus it affords no chemical protection to iron, as zinc does, but acts with it precisely as happens with tin, that is, the iron rusts wherever it is exposed to air and moisture; nor does the aluminium itself resist, under these circumstances, the same decomposing influences; on the contrary, it becomes rapidly coated with a white powder (alumina), and scales off. Tin and aluminium do not unite, but when brought into temporary contact by the intervention of another metal, the aluminium soon oxidises; with lead aluminium refuses to combine, though copper takes up a portion, and forms with it a bronze-coloured alloy. It may be made to unite with mercury, but the amalgam is very unstable, and soon oxidises. Upon the whole, therefore, we very much question whether this much-talked of metal will ever be of much practical use, except when employed in its pure state; and at present the high price of aluminium (more than £30 per lb.) entirely excludes it from employment. It is indeed, every way probable that a cheap mode of manufacturing it will soon be discovered, and something of the kind is already whispered about; but until the event becomes a marketable fact, we see no reason to indulge in prospective hopes that aluminium will ever substitute tin.—*Journal of Gas Lighting, &c.*

CAPTAIN NORTON'S INVENTIONS.

It would seem that Captain Norton's inventions stand a chance at last of having their usefulness and practicability fairly tested, for he has received instructions to forward to the Emperor Napoleon a separate description of each of his inventions, which he desires to have tested; and his Majesty will then give orders, if he thinks necessary, that they shall be tried by competent authorities. This has been brought about in consequence of Colonel Fleury having placed some of the inventions under the notice of the Emperor. The following communication has been received by Captain Norton on the subject, who has acted in accordance with the instructions therein contained. We hope the French official communication will be found to mean more than similar ones in this country usually imply.

"Cabinet de l'Empereur,
Palais des Tuileries, 29 Janvier, 1856.

Monsieur,—Je vois par les lettres que M. le Colonel Fleury m'a transmises, que vous désirez faire connaître au Gouvernement Français plusieurs inventions dont vous êtes l'auteur. Chaque question de cette nature devant être soumise à l'examen du ministre qu'elle concerne, vous devez, si vous le jugez convenable, envoyer à l'Empereur une description séparée de chacune de vos inventions. Sa Majesté donnera alors des ordres, s'il y a lieu, pour qu'elles soient appréciées par des hommes compétens. Je suis chargé de vous le faire savoir.

Recevez, monsieur, l'assurance de mes sentimens tres distingués,
L'officier d'ordonnance de l'Empereur,
FAVÉ.

"M. Norton, Rosherville Hotel."

LORD WROTTESLEY ON INSTRUCTION IN SCIENCE.*

The most important questions, doubtless, that can be agitated are those of the means to be adopted for improving the elementary instruction given in our schools, and for rendering the teaching of physical science more general at our Universities; but on these time will not permit me now to enlarge. The difficult consideration of the extent to which public aid ought to be afforded to popular lectures has been raised. I am not disposed to agree either with those who altogether condemn this mode of imparting instruction, or with those who anticipate great advantages as likely to accrue to the cultivation and diffusion of science from its extension. There can be no doubt that latent talent has been sometimes called into existence by superficial teaching; and, on the other hand, that superficial teaching will never confer sound knowledge. Diligent and earnest private study alone can put the seal of authenticity on information acquired in the lecture-room. But when we consider what a large proportion of our fellow-subjects have neither the means nor the opportunity of studying at the Universities or of otherwise acquiring the knowledge referred to, and the great advantages that would result to the middle classes and the higher grade of artizans from acquaintance with at least the elementary truths of science, it is worthy of serious consideration whether a certain amount of support by the State should not be conceded to popular lectures, and also to educational establishments, at which the elements of the physical sciences may be taught on a more general and systematic plan to students, who shall be invited and expected to enter on their study with a serious intention of learning, so far as their means and opportunities extend.

In connection with this subject of the scientific instruction of the masses, it is impossible to overlook the effects which may be produced by the publication, within the last few years, of works written, it may be, in a somewhat unphilosophical spirit, and propounding theories which rest on unsubstantial foundations, but written with great ability, and calculated powerfully to excite the imagination of those by whom the truths of natural science have been little studied.

* From an Address to the Royal Society.

Hand-book of Natural Philosophy. By Dionysius Lardner, D.C.L., &c., &c. *Hydrostatics, Pneumatics, and Heat.* With two hundred and ninety-two Illustrations. London: Walton and Maberly. 1855.

Hand-book of Natural Philosophy. By Dionysius Lardner, D.C.L., &c., &c. *Optics.* With two hundred and ninety Illustrations. London: Walton and Maberly. 1856.

These volumes constitute the second and third portions of the improved edition of Dr. Lardner's invaluable Hand-book, the first part of which was noticed with entire approbation at page 443 of our last volume. We feel much pleasure in commending them to our readers. The publishers have evidently spared no expense in their prepa-

ration, but have availed themselves of all the resources open to them in order to make them all that can be desired. The former edition was much superior to any other work of the kind with which we are acquainted, but the edition before us is still better, being arranged and divided more satisfactorily, expanded in many places with additional matter, and enriched with very many new illustrative engravings, executed in a remarkably effective manner.

MECHANICAL LOCOMOTION.

To the Editor of the Mechanics' Magazine.

SIR,—The great confusion in the ideas of your correspondents in a recent discussion, respecting the leverage of locomotive machines, strongly attracted my attention; and I am glad to find that it was observed by your experienced friend, Mr. Cheverton, who considers that I (with many others) am perplexed and bewildered with an erroneous fundamental principle, which he endeavours to clear away by declaring that when the motive "force is not external to" the machine, "but moves with" it, "the fulcrum is of course some part of the vehicle itself," and that on that "supposition" only can the crank be the medium of evolving from the successional lever (or wheel) the same amount of force at points equally distant above and below the axle, arguing ingeniously that, were the fulcrum at the rail, the crank would act with a leverage of the second order in the one case (the former), and of the third in the other. I wish to suggest to him, and to those in general who take an interest in this important subject, a simple hypothesis, by means of which I think that this difficulty may be cleared away, without resorting to supposition, or to anything less certain than the most rigid application of the common laws of science. Taking the case of a common horizontal outside cylinder engine, with the crank at full power below the centre, and the steam occupying the space between the face of the piston and the front end of the cylinder, and pressing on each with a force of 1,000 lbs., I calculate the result to be as follows:—The reactive pressure of 1,000 lbs. on the end of the cylinder impels the engine forward with a power which is not counteracted by any corresponding pressure, except such as may ultimately arise from that on the piston, which I think indisputably can only operate against the reaction in the cylinder *by means of a lever of the third order;* the spoke, which, if the crank-pin is half way down the wheel, would make the power of the piston to press against the axle with a force of 500 lbs., in a direction contrary to the push of the reaction, whether its fulcrum were at the foot or at the centre, and so leave a propelling power of 500 lbs., arising not from the piston, but from the reaction, and amounting in the under stroke to a propulsion of the engine twice the length of the stroke, at half the power of the pressure in the cylinder. If the crank be equally above the centre, and the reactive pressure of the steam at the other end of the cylinder, I consider the crank to be then the lever of the second order which Mr. Cheverton speaks of, and as such it will now overcome the reactive pressure *by its leverage* of advantage, as before, its leverage of disadvantage allowed the reactive pressure to overcome it; a constant balance of forward pressure is thus kept up, of the same amount at the same points of distance of the crank from the axle. I believe that no fallacy can be detected in this calculation, which is, a rigidly correct application of the laws of science, and accounts completely for the motion of the engine, without calling in anything supposititious or uncertain; and when I find myself able to explain the operation of the engine thus clearly, I, of course, am by no means perplexed or dubious. I have chosen the simplest illustration to argue from, but have no difficulty in applying this idea to upright or inclined cylinder engines. Mr. Cheverton will, no doubt, admit that by the simplest rules of leverage the power of the piston would, in the supposed engine, reach the axle at only 500 lbs.; and if so, the reactive force of 1,000 lbs. must necessarily overcome it, and the pressure of 500 lbs. against the adhesion, be it "moving" force, or simply, as I contend, the ordinary pressure at the fulcrum of a third order lever must be carried up again into the engine before it can even begin to balance or overcome the reaction. Experiments, invariably, point blank confirm these views; and if there is an error in my calculation of the forces, it must be easy, in so short and simple a problem, to point it out. Having thus furnished another theory, by means of which we can conceive the crank to act, equally, both above and below the centre, I wish to ask Mr. Cheverton whether there must not necessarily be a dead lock in all machines having no independent fulcrum, from the reaction being equal to any power that may be exerted in the machine, and opposite to it in direction? Pass it through as many mutations as you will, I conceive that that great law cannot be eluded, and will surely keep motionless every apparatus that does not ultimately find either a fixed obstacle, or, like the locomotive, a successional fulcrum in the adhesion, to press against, and so enable power to be developed. If Mr.

Cheverton substitutes two horses pulling cords for the action and reaction of the steam, I think that it will make these points clearer; they may stand on the ground, for if up in the machine, the reaction of one would balance that of the other, and leave the experiment unaffected; but it would become plain that we must give full weight to the reaction, as well as to the action, in machines of this kind.

Regretting again to differ from Mr. Cheverton, I beg to say that I believe that the exposition of the motion of a boat which he complains of, is quite correct, as far as it goes; and if he wishes, I will give him my completion of it, which is of my own working out.

I am, Sir, yours, &c.,

C.

March 11, 1856.

CONSTRUCTING MORTARS AND ORDNANCE.

To the Editor of the Mechanics' Magazine.

Sir,—I take the liberty of submitting to you for insertion in your Magazine, a brief description of a new mode of constructing mortars or heavy ordnance. I may mention, that a small model has been submitted to several scientific gentlemen for their consideration, some of whom think it would answer, while others think not; and in the absence of actual experiment, its publication at the present time may not be out of place.

I propose therefore to have cast in the shell of mortars, or other ordnance, circular perforations extending longitudinally from the mouth, to a short distance beyond the breech. The perforations to be midway between the inside and outside of the shell. If the mortar to be cast is required to throw very heavy shot, perhaps two or three rows of perforations may be found requisite, to keep the mass of metal as uniform as possible, and to give greater strength to the shell itself. By this means it is proposed to do away with the cancellated or spongy nature of large masses of metal, and to effect, what has been found up to the present time impracticable, the casting of large ordnance.

I am, Sir, yours, &c.,

Thomas Aimerill.

Busby, New Glasgow, March 3, 1856.

GARDNER'S SMOKELESS FURNANCE.

To the Editor of the Mechanics' Magazine.

Sir,—Manufacturers in general are, I believe, much puzzled and annoyed at the Smoke Nuisance Removal Bill; not that they wish to create a nuisance, but to know what apparatus with safety to apply to meet its requirements. This has been the case with me, although patents are so numerous. I have not until lately, although I have repeatedly attempted, succeeded. That I have done so, is now a "*fait accompli,*" and I may add, not only do we with the most ordinary care make "*no smoke,*" but we can *rapidly generate steam and effect a great saving of fuel.* This is so important, that I think it right through your kindness to make known the facts, both to aid my fellows and in justice to the patentee, and to state this has been effected by the use of *E. V. Gardner's Patent Smoke Deflecting Apparatus,* which is both effective and most beautifully simple in its arrangements. Its merits have deservedly my hearty recommendation.

I am, Sir, yours, &c.,

Frederick Allen.

Chemical Manufactory, Bow-common,
March 5, 1856.

CHATTAWAY'S COUPLING AND BUFFING APPARATUS.

To the Editor of the Mechanics' Magazine.

Sir,—Seeing in your Magazine of March 1st, a notice of Chattaway's Buffing and Coupling Apparatus, I beg to say that I am very much mistaken if I did not see the identical plan in question, last summer, in the United States. I shall be much obliged if you can give me any information on the subject as to whether Mr. Chattaway has a patent for the States or not.

If not, I think it is only fair that the Americans should have the credit of the invention.

I am, Sir, yours, &c.,

Americanus.

[We are not aware whether Mr. Chattaway has or has not patented his apparatus in the States. "Americanus" should remember that the credit of the invention can hardly be given to the Americans, unless he has something definite to lay before us in support of the claim he makes for them.—Ed. M. M.]

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Stanley, J. *Improvements in weighing machines, and weights used with the same,*

which improvements apply principally to weigh-bridges, weighing-cranes, and the class of weighing-machines acting upon levers, steel-yards, &c. Patent dated August 2, 1855. (No. 1748.)

A description of this invention will be given hereafter.

SAUNDERS, J. *An improved roller for cloths and other fabrics.* Patent dated August 2, 1855. (No. 1749.)

This invention consists in constructing a roller which shall be readily adjustable to any width of cloth which may be rolled upon it. For this purpose the roller is made in two or more parts, and one part is caused to fit upon or over the other so as to allow the roller to be lengthened or shortened within the necessary limits.

WOLLER, S., and J. BUTTERFIELD. *Improvements in machinery for weaving figured fabrics.* Patent dated August 2, 1855. (No. 1750.)

This invention consists—1. In allowing the hooks of a Jacquard machine to be at rest, and free from the knives of the grife, when they are pressed back by the cards. 2. In disengaging the cylinder or swing frame to allow the cards to be worked backwards or forwards independently of the other parts of the machine. 3. In a described combination of parts, composed of weights, wires, and springs, for preventing the vibration of the harness.

BODMER, R. *Certain improvements in rotatory steam engines.* Patent dated August 2, 1855. (No. 1751.)

These improvements relate to certain contrivances by which the piston of that kind of rotatory steam engine in which the piston barrel is concentric with the cylinder is allowed to perform a complete revolution, without prejudice to the proper and regular working of the engine.

TILGHMAN, R. A. *Improvements in the manufacture of candles.* Patent dated August 2, 1855. (No. 1752.)

This invention consists in using in candles filaceous or spongy substances, which will act like a very thick wick in absorbing the fluid grease below the base of the flame, but which are so prepared by chemical processes that, on the approach or contact of the flame itself, they are gradually destroyed or shrivelled up, leaving the true candle wick of the proper size. It also consists in covering the outsides of candles with a solution of gun-cotton (or similar substance), which forms a dry and smooth covering, and which, as the candles burn, prevents the melted grease from running.

WATSON, H. H. *Improvements in the manufacture of coke.* Patent dated August 3, 1855. (No. 1755.)

A description of this invention was given at page 205 of No. 1699.

LANE, J. *An improvement or improvements in the manufacture of gold leaf.* Patent dated August 3, 1855. (No. 1756.)

A description of this invention is given at page 226 of our last No.

BELLFORD, A. E. L. *Certain improvements in grinding-mills.* (A communication.) Patent dated August 3, 1855. (No. 1757.)

The inventor describes a mill which consists of a stone table so arranged as to bear a millstone scooped out in the centre, so as to form a crown or ledge of mill burr of suitable width, dressed in the same manner as other millstones. The grinding plate, which acts instead of the common runner, has sufficient weight to effect the grinding on another millstone in lieu of the stationary stone; the upper part of this stone has a plane surface, and lateral projections which fit into certain interior and exterior indentations made in the circumference of the runner.

MOURGUET, J. B. *An apparatus for the destruction of the weevil, its larves and its eggs, whilst drying the corn, without injuring its ordinary properties.* Patent dated August 3, 1855. (No. 1758.)

This invention comprises an apparatus with compartments, tubes, and stop-cocks; and the application of heat, supplied by steam, or gas, to asphyxiating the weevil and other like insects, and destroying their larves and eggs.

GLOVER, F. R. A. *Improvements in the means of carrying knapsacks, and other burdens upon or from the shoulders.* Patent dated August 3, 1855. (No. 1760.)

This invention consists in the combination of a pair of pads or bearers adapted to the shoulders of the wearer, and projecting backwards and forwards, so that the burden to be carried may rest upon, or be suspended from, one or both of the ends of each bearer.

TILGHMAN, R. A. *Improvements in the manufacture of alkalies and alkaline earths.* Patent dated August 3, 1855. (No. 1762.)

This invention consists in decomposing the sulphates of the alkaline earths by exposing them at a high heat alternately to the action of deoxydizing and oxydizing agents, whereby the sulphuric acid is gradually driven off, and the alkaline bases are left in a free state.

BETJEMANN, H. J. *Improvements in extending tables.* (A communication.) Patent dated August 3, 1855. (No. 1763.)

This invention consists in applying to a telescopic table, racks and pinions, and clicks, or catches in such manner that the various sliding pieces of the table may be

continuously pushed out, or drawn in, by means of a continuous rotation of a crank handle, in one or the other direction, as the case may be.

RICHARDSON, R. and W., Greenshields. *Improvements in chenille fabrics.* Patent dated August 3, 1855. (No. 1767.)

Claims.—1. The mode of manufacturing or producing chenille fabrics by working parti-coloured chenille material upon or into ground fabrics. 2. The use of parti-coloured chenille material for the manufacture or production of ornamental coloured designs upon ground fabrics.

HALL, E. *Improvements in the manufacture of gunpowder.* Patent dated August 4, 1855. (No. 1773.)

A description of this invention was given at page 204 of No. 1699.

AVERY, J. *Improvements in windlasses for ships and other purposes.* (A communication.) Patent dated August 6, 1855. (No. 1777.)

The first part of this invention consists in an arrangement of gearing, whereby the speed of the windlass shaft may be increased or diminished by reversing the direction of the movement of the hand levers, and increased power obtained when speed is not essential, and speed obtained when power is not required. The second part consists of a device applied to the drums over which the chains pass, so arranged that the necessary friction may be brought to bear upon pulleys to prevent casual turning.

GILBEE, H. *Certain improvements in constructing flat-bottomed boats.* (A communication.) Patent dated August 6, 1855. (No. 1778.)

This invention consists in the employment of a waterproof cloth, in combination with a suitable frame, to which the cloth is affixed by means of ropes, in the construction of flat-bottomed boats which may be taken to pieces with ease when desirable.

WILSON, F. A. *A portable cooking-apparatus, suitable for campaigning purposes.* Patent dated August 6, 1855. (No. 1779.)

This invention comprises the following parts:—1. A camp kettle or apparatus for roasting, baking, broiling, frying, stewing, and boiling purposes, the stove, oven, boiler, pans, kettles, and other articles (portions of which are also designed for eating and drinking purposes), being so constructed and varied in dimensions that the respective parts, when not in use, can be packed one within the other, the whole being enclosed within the largest part. 2. A stove for cooking purposes only, comprising a stove, oven, boiler, pans, and kettles, the various parts of which are also formed so as to fit one within the other. 3. A revolving apparatus, which consists of a single cylinder and covering plate, or double cylinders placed one above the other, the upper one fitting in the lower. By the revolving principle the whole of the pans, &c., may be turned round to any required position at the side. 4. A roasting-apparatus, which consists of a shield to which a telescopic pipe is attached, this pipe enclosing a string or worsted which is fixed where the pipe is attached to the mantel piece or other support.

PLATT, J., and J. HIBBERT. *Improvements in mules for spinning and doubling, which improvements are also applicable to other machines in which clutch-boxes are used.* Patent dated August 6, 1855. (No. 1780.)

Claim.—A general arrangement and construction of apparatus, particularly the use of a ratchet and click, such click being placed in and out of gear by the sliding of a loose and independent part, for the purpose of transmitting the driving power from one part of the machine to another, so as to facilitate disconnection.

PRADEL, H. A. *Certain improvements in twisting textile goods or fabrics.* (A communication.) Patent dated August 6, 1855. (No. 1781.)

This invention consists in drawing threads or other similar materials to be twisted from reels or bobbins, each held in suitable frames upon a bed to which rotary motion is communicated from a central shaft which is also made to rotate, and in stretching the threads regulating the tension upon them, and preventing any twist therein until two, three, or more are made to unite at the top of the central shaft, the rotation of which unites and twists all the threads together.

BEDELLS, C. *An improvement in the manufacture of elastic fabrics.* Patent dated August 7, 1855. (No. 1784.)

This invention relates to the cementing of sheet vulcanized India-rubber in a distended state between two surfaces of fabric woven in a warp and shuttle loom, and the improvement consists in coating both sides of the sheet of vulcanized India-rubber with India-rubber cement before placing it between the two coated surfaces of woven fabric.

LISTER, S. C. *Improvements in hackling, combing, and treating flax, wool, and other fibrous materials before being spun.* Patent dated August 7, 1855. (No. 1785.)

These improvements consist of a new hackling or combing machine; also in mixing certain cotton or silk fibres before or after being hackled or combed. The machine is made to work in the following manner:—The fibrous material being first carded, or otherwise brought into a sliver, is fed into a feeding head, which has a to-and-fro motion given to it by a crank or

otherwise. A pair of jaws take hold of the ends of the fibres protruding from the feed-rollers, and, as the feeding head recedes, detaches a portion of the fibre. The jaws are so arranged that each of them forms the segment of a circle, and they are fixed to a frame so as to form a complete circle of nipping jaws.

MANNING, J. A. *Improvements in the treatment of sewerage.* Patent dated August 7, 1855. (No. 1786.)

Claim.—The application and use of alum slate, alum shale, alum schist, alum stone, alum ore, and other aluminous minerals and earths as precipitating and clarifying agents for cleansing sewerage matters.

TILESTON, W. M. *Improvements in machinery for ruling paper.* (A communication.) Patent dated August 7, 1855. (No. 1790.)

The most important feature of this invention consists in ruling across and along, or up and down the paper, by passing the paper only once through the machine, an arrangement being provided for changing the direction in which the paper moves through the machine, after the first set of lines is ruled, to one at right angles to its first direction. The invention also comprises a method of lifting the pens from the paper, so as to leave any desired width of heading—a method of supporting the ruling pens, so as to prevent them from soiling the paper when not in use—a method of guiding the sheet from the pens which rule it in one direction to those which rule it at right angles thereto —and a method of discharging the ruled sheets into a receiver, so as to prevent them from adhering to each other.

PYCOCK, B. W. *Improvements in curtain fixtures.* (A communication.) Patent dated August 8, 1855. (No. 1792.)

The inventor describes apparatus for raising, lowering, and securing curtains or blinds, and claims the combination of certain cords with a tassel or piece and a cam lever.

SMITH, N. *An improved horse-rake.* Patent dated August 8, 1855. (No. 1794.)

An illustrated description of this invention will shortly be given.

HADDAN, J. C. *Improvements in the manufacture of rifled and other cannon.* Patent dated August 8, 1855. (No. 1795.)

A description of this invention was given at page 226 of our last No.

COOLEY, R. B. *Improvements in the manufacture of hats.* Patent dated August 8, 1855. (No. 1796.)

This invention consists in the use of an elastic fabric—that is to say, a knitted or looped fabric, as a covering for hat-bodies. The inventor prefers employing a tubular elastic fabric pile or other, of the size of the body of the hat. (The invention also comprises the formation of hat bodies, by stretching a tube of elastic fabric over the block, and then dipping it into stiffening material.

DEVY, P. A. *Improvements in hair fabrics.* (A communication.) Patent dated August 8, 1855. (No. 1797.)

This invention consists in producing a fabric from the human hair, in the state in which it can be procured from hair-dressers. The hair is to be spun into a yarn, and woven either as weft with linen or cotton warps, or with warp and weft of the same material.

SIDEBOTTOM, J. *Improvements in shuttles and in skewers for shuttles and other purposes.* Patent dated August 9, 1855. (No. 1799.)

This invention consists in improved modes of constructing shuttles and skewers for shuttles and other purposes, whereby the cops are easily placed upon and securely held on the skewers during the operation of unwinding.

DELPERDANGE, V. *A new mode of constructing and joining tubes and pipes.* Patent dated August 9, 1855. (No. 1800.)

These improvements consist in constructing each tube or pipe with an enlargement or packing at each end, instead of the usual collar or coupling box. The connecting joint of tubes thus constructed is effected by means of a ring of vulcanised India-rubber or other elastic material, which ring encircles the packings of the adjoining tubes, and is itself embraced by a metal collar.

COOKE, E. *An improvement or improvements in moulds used in casting certain parts of metallic furniture.* Patent dated August 9, 1855. (No. 1801.)

This invention relates to the moulds used in casting the corner blocks, &c., of metallic bedsteads, &c. The parts of these moulds are hinged together so that they may clasp the parts which are to be combined, and the melted metal is then poured in; the casting is thus formed in its place. In this invention the moulds are themselves cast in metal moulds, and not in sand, as is usual.

FONTAINEMOREAU, P. A. L. DE. *Improvements in feeding steam boilers.* (A communication.) Patent dated August 9, 1855. (No. 1804.)

This invention consists of apparatus for condensing the waste steam from high-pressure engines, and feeding the boilers with it. A pipe conveys it from the cylinder into a copper cylindrical vessel, into which cold water enters, through a finely-perforated spreader, in small streams. The condensed steam then runs into a receiver, whence it is pumped into the boiler. The injection of cold water is regulated by a float in the receiver.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BUFNOIR, G. *Certain improvements in stopping bottles and other vessels.* Application dated August 1, 1855. (No. 1745.)

This invention consists in using earthenware, porcelain, wood, glass, and other stoppers, in conjunction with India-rubber washers, and any kind of wire or metallic slips, for the purpose of securely stopping bottles, jars, &c.

GLUKMAN, L. *An improved box for papers, letters, and other documents.* Application dated August 1, 1855. (No. 1746.)

This invention consists of a box, to the lid of which is fastened one end of a spring, the other end being attached to the body of the box, thus rendering it self-closing. In the lid provision is made for holding labels, &c.

AIREY, D., and W. H. LACKABANE. *Improvements in rotatory steam engines.* Application dated August 2, 1855. (No. 1753.)

This invention consists of a cylinder or roller working excentrically inside a circularly-bored cylinder, against one side of which it bears constantly, a suitable packing piece being fitted into a longitudinal groove in the inside of the cylinder, at the part where the roller bears, in order to prevent the steam from getting entirely round the roller.

FULLARD, G. H. *An improved pin for thatch coverings for stacks and roofs.* Application dated August 3, 1855. (No. 1759.)

This invention consists in forming the pins of metal with a worm or screw at that end where the pin is to enter the thatch. At the opposite end the pins are formed with a flat head, over which a handle may be placed to screw the pin into the thatch.

PFAFF, J. C. A. *Improvements in obtaining and applying motive power.* Application dated August 3, 1855. (No. 1761.)

This invention consists in an arrangement of machinery in which a column of liquid is made to act upon two pistons at the same time, these pistons being placed in suitable cylinders, and connected to balance levers, communicating by means of any suitable gearing with a shaft. The levers and pistons are to be returned to their first positions by balance weights, which also again raise the water used as a motive power!

RITCHIE, C. and G. *Improvements in preparing cork and other materials for stuffing.* Application dated August 3, 1855. (No. 1764.)

These improvements consist in combining ground cork with hair, wool, cotton, and other fibrous substances, for the purposes of stuffing, by grinding the cork with the hair, &c., so as to well mix them.

JOHNSON, J. H. *Improvements in the manufacture of metallic waterproof fabrics or materials, and in the application thereof.* (A communication.) Application dated August 3, 1855. (No. 1765.)

The inventor forms a fabric having metallic cloth or wire gauze as a foundation. This metal foundation is steeped in or coated with any known waterproofing mixture.

JOHNSON, J. H. *Improvements in the purification of gas for illuminating purposes, by separating therefrom the carbonic oxide, and in the application of such carbonic oxide to heating purposes.* (A communication.) Application dated August 3, 1855. (No. 1766.)

These improvements consist in separating carbonic oxide from ordinary illuminating gas, whether made from coal or water, by the aid of charcoal, particularly wood and animal charcoal, and in afterwards withdrawing the carbonic oxide from the charcoal, and passing it into a gasometer for heating purposes.

JOHNSON, J. H. *A new material for ornamenting various articles.* (A communication.) Application dated August 3, 1855. (No. 1768.)

This invention consists in the production on paper or cloth of any kind of an imitation japan, composed of various colours or materials, according to taste.

PERROT, H. L. R. *An improved escapement for chronometers.* Application dated August 4, 1855. (No. 1769.)

Instead of the escapement now ordinarily used in chronometers, the inventor proposes to substitute a more simple one. The wheel rests on a ruby roller, larger in size than the roller of a duplex escapement, and this roller is flattened on one portion of its periphery. On the axis roller is placed a small indented piece of steel, and a small arm projecting on one side in the direction of the balance axis. The principal novelty is a spring carrying a head at the extremity of its slight blade, this head projecting laterally, and holding horizontally a ruby stone, which turns on a pivot fixed in the centre of the head.

WHITEMAN, E. *An improvement in the manufacture of waterproof coats, boots, capes, overalls, and other garments.* Application dated August 4, 1855. (No. 1771.)

This invention relates to the use in the manufacture of coats, capes, boots, leggings, &c., of a peculiar preparation of leather, intended to ensure warmth, and impermeability to rain and moisture.

ANDERSON, J. *Improvements in shirts.* Application dated August 4, 1855. (No. 1772.)

The improved shirts bear a close resemblance to a surtout, or wide-skirted coat,

being open all down the front, like a coat of that class.

GEDGE, J. *Obtaining and employing motive power.* (A communication.) Application dated August 6, 1855. (No. 1775.)

The patentee describes an air apparatus, which is composed of wings placed in a horizontal position round a vertical shaft, each pair of wings (which may be multiplied at discretion) being placed on a horizontal axle, to which is adapted two frames intended to act in a rectangular direction, and separated by the upright shaft aforesaid.

LILLEY, J. *Improvements in obtaining textile fibres, and in the manufacture of pulp and dyes.* Application dated August 6, 1855. (No. 1782.)

This invention consists in the employment of a plant which is the growth of West Africa, and known at the Cameroons by the name of "Medickey." To obtain textile fibres the stem of the plant or tree is bruised or crushed so as to detach the woody portions therefrom, and the fibres afterwards treated in the same manner as flax and hemp. To manufacture pulp and dye from these fibres, they are submitted to simple infusion or maceration in warm water, or to a steaming operation, and the dye is thereby obtained in solution, leaving the fibrous pulp, which may be bleached by any known process.

HAMNETT, J. *Improvements in shuttle tongues.* Application dated August 7, 1855. (No. 1783.)

Instead of the spring forming a bow on the tongue, whether in or out of the shuttle, the inventor arranges it, so that when it is out of the shuttle (that is, in a position to put on the cop), the spring is flat to the tongue, and will thus enter the cop without breaking or injuring the interior thereof, but when the tongue, with the cop on it, is put into the shuttle, the spring bows out, and secures the cop, so that it may be used almost to the last thread.

NASMYTH, G. *Improvements in preserving animal and vegetable matters.* Application dated August 7, 1855. (No. 1788.)

This invention relates to the use of carbonic acid gas, in combination with vapour or gas obtained in a cold or natural state from alcohol or alcoholic spirits, for the purpose of preserving animal or vegetable matters in suitable vessels or cases.

MURPHY, W. J. *Improvements in obtaining motive power.* Application dated August 7, 1855. (No. 1789.)

This invention consists in the application of vapour of alcohol, spirits of wine, or any other spirituous liquors, as a moving power in the boilers of steam engines, and in the condensation of such vapour after having been used, and in feeding the boilers therewith.

HOPKINSON, W. *Improvements in steam engine-boilers, furnaces, and apparatus connected therewith.* Application dated August 8, 1855. (No. 1791.)

This invention consists in the use of one high-pressure cylinder between two condensing cylinders, the high-pressure making two strokes for one of each of the condensing, by which each condensing cylinder is fed alternately from each exhaust of the high-pressure.

BARON, W., J. LANG, and H. LIVERSAGE. *Improvements applicable to machinery for winding and for sizeing or dressing yarns or threads.* Application dated August 8, 1855. (No. 1793.)

The improvements in winding refer to those machines in which yarns or threads are wound from the cop, and consist, firstly, in adapting thereto a rod or other guide over or through which the material passes previously to its reaching the bobbin, and by which the inventors are enabled to avoid, in great measure, the waste arising from the "back lash" in the cop, and generally to effect the winding more perfectly. They consist, secondly, in inclining the spindles from which the yarn is wound, so that the nose of the cop is lower than the base.

LATOUR, P. and M. *Certain improvements in looms for weaving.* Application dated August 9, 1855. (No. 1802.)

This invention consists in substituting for shuttles carrying the woof-thread, a thread-holder fed by a bobbin—in stopping the loop formed by woof-thread, by a thread conveyed by a particular shuttle, and in a method of causing the thread-holder to convey the thread once through the warp, without any crossing.

BACHOFFNER, G. H. *Improvements in appropriating certain public erections for advertising purposes.* Application dated August 9, 1855. (No. 1805.)

This invention consists in applying to lamp or other street posts, rectangular cases furnished with panels to receive bills, placards, &c.

PROVISIONAL PROTECTIONS.

Dated December 1, 1855.

2711. Sir Charles Edward Grey, of Rue du Mont Thabor, Paris, France. The use of a new vegetable material for raising the nap and dressing woollen cloths and webs and tissues.

Dated January 11, 1856.

87. William Smith, of Little Woolstone, Bucks,

farmer. Improvements in ploughs and other cultivating implements.

Dated January 16, 1856.

111. Thomas Dunn, of Windsor-bridge Iron-works, Pendleton, Lancaster, engineer. Improvements in boilers and apparatus for heating water and generating steam.

Dated January 25, 1856.

205. Gentle Brown, of Swinton, near Rotherham, York, gentleman. An improvement in the manufacture of cast steel.

Dated February 9, 1856.

343. John Elce and Samuel Fletcher Cottam, of Manchester, machinists. An improved mode of lubricating the spindles of machinery used in preparing and spinning cotton and other fibrous materials revolving in a lifting rail.

349. Theodule Cavé, of Paris, France. Improvements in oil lamps, which he calls the "Continual Lamp."

Dated February 11, 1856.

353. William Henry Zahn, of New York, United States, and Joseph Henry George Wells, of Ebenezer-place, Neckinger-road, Bermondsey, Surrey, mechanical engineer and draughtsman. Improvements in windmills or wind engines.

355. Thomas Steven, of the Milton Foundry, Glasgow, Scotland, ironfounder. Improvements in the construction of open and close stoves, which improvements are applicable in part to kitchen ranges and boiler fire-places.

Dated February 12, 1856.

357. Joseph Marie Guidicelli, of Rue Bonaparte, Paris, France, gentleman. Improvements in the transformation of movement in steam engines and other machinery.

359. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in the manufacture of cast steel. A communication.

Dated February 13, 1856.

361. Frederick Steiner, of Accrington, Lancaster, Turkey red dyer. Improvements in machinery to be used in drying fabrics.

365. William Frederick Collard Moutrie, of King-street, Holborn. An improvement in the damper action of pianofortes.

367. Richard Knight, of Foster-lane, London. Improvements in medical chests.

369. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in the manufacture of zinc. A communication.

371. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in springs applicable to railroad carriages, and to other uses. A communication.

373. John Barber, of Manchester, Lancaster, engraver to calico-printers. Improvements in steam engines.

375. William Parsons, of Hugh-street, Pimlico, Middlesex. Improvements in spindles for locks and latches.

Dated February 14, 1856.

379. Stephen Rossin Parkhurst, of New York, United States. Improvements in sails and rigging for vessels.

380. Walter McFarlane, of Glasgow, Lanark, engineer. Improvements in building and structural works, and fittings in metal.

381. John Emsley, of Bolton-road, Bradford, York, overlooker. Certain improvements in tube-spinning frames employed in spinning worsted-yarn and other fibrous substances.

383. John Taylor, of Spring-grove, Hounslow, Middlesex. An improvement in constructing and facing walls.

385. Edmund Morewood and George Rogers, of Enfield, Middlesex. Improvements in drying and coating iron and copper.

386. William Watson Hewitson, of Headingley, near Leeds. An improvement in casting the bearings or brasses of machinery.

387. Thomas Evans Blackwell, of Clifton, near Bristol, gentleman. Improvements in condensing steam, and in cooling and heating fluids.

389. George Gulliver and John Goldthorpe, of Barnsley, York, ironmongers, &c. An improved signal bell.

Dated February 20, 1856.

424. Richard Laming, of Carlton Villas, Maida Vale, Paddington, Middlesex. Improvements in purifying gas, in preparing materials useful for purifying gas, and in apparatus to be used in purifying gas and disinfecting gas liquors or washings.

426. William Muir, of the Britannia Works, Manchester, engineer. Improvements in slide-lathes.

428. William Lynn, of H. M. Dockyard, Portsmouth, Assistant Inspector of Machinery. Improvements in the construction and mode of applying screws for propelling vessels.

430. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. Improvements in working railway switches and crossings, and certain indicating apparatus for preventing accidents on railways. A communication from A. Dumas, of Paris.

432. William Clibran and Joseph Clibran, of Manchester, machinists and manufacturers of gas-regulators. Improvements in and applicable to apparatus or mechanism for measuring and regulating the flow of gas, and in the mode of constructing parts thereof.

434. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for lubricating bearings, parts of which improvements are applicable to the raising or elevating of liquids. A communication from E. Bourdon, of Paris, France, mechanical engineer.

Dated February 21, 1856.

440. Isaac Moll, merchant, of Cologne, Prussia. The treatment of sulphate of alumine of commerce, and its formation of compounds useful for the disinfecting of organic substances in a state of putrefaction, as well as for other purposes.

442. Jacques Henri Marie Maissiat, of Paris, France. Improvements in projectiles for fire-arms.

444. Thomas Bennett and Wilfred Preston Dugdale, of Farnworth, Lancaster, spindle and flyer-manufacturers. Improvements in flyers used in spinning-machinery.

446. Frederick Enthoven, of Moorgate-street, London, gentleman. An improved cover for gunpowder and other canisters and vessels. A communication from C. Enthoven, of the Hague.

448. William Clarke, of Nottingham, manufacturer. Improvements in the manufacture of warp fabrics.

Dated February 22, 1856.

452 John Sharp Cromartie Heywood, of Battle-bridge, Middlesex, and George Lloyd, of Great Guilford-street, Southwark, Surrey. Improvements in condensing vapours in distillatory opera-

tions, the manufacture of varnishes, melting and distilling of fats and other manufacturing or chemical operations and obtaining useful products therefrom.

454 John Kingsford Field, of Lambeth, Surrey wax-chandler, and Charles Humfrey, of the Terrace, Camberwell, Surrey, gentleman. Improvements in the manufacture of paraffine candles.

456. James Griffiths, of Wolverhampton, Stafford, engineer. A new or improved brake for colliery and other steam engines.

Dated February 23, 1856.

460. Edward Schischkar, of Halifax, York, manufacturer. Improvements in cleansing silk, hair, wool, yarn, and textile fabrics.

464. George Holme Spencer, of Heathersage, near Sheffield, Derby, manufacturer. Improvements in the manufacture of card surfaces employed in carding cotton and wool.

466. Thomas Goode Messenger, of Loughboro', Leicester, plumber. Improvements in boilers.

468. Joseph Scudamore, of Mitcheldean, Gloucester, gentleman. An improvement in domestic stoves or grates.

470. Henry Loveridge, of Wolverhampton. An improvement in feet, hip, and slipper baths, also in bases for shower baths and basins for washing, and other purposes.

472. Samuel Rodgers Samuels, of Nottingham. Improvements in weaving fabrics.

Dated February 25, 1856.

474. Louis Normanby, of Judd-street, Brunswick-square, Middlesex, civil engineer. Improvements in the mode of constructing and fixing the rail of railways. A communication from L. D'Aubréville, of Rue de l'Echiquier, Paris, civil engineer.

476. Frederick Kersey, of Laurie-terrace, St. George's-road, Southwark. An improvement in the manufacture of drain pipes.

478. Robert Hawthorn and William Hawthorn, of Newcastle-upon-Tyne, engineers. An improved arrangement of steam pump.

480. Charles Frederick Claus, of Latchford, Chester, chemist. Improvements in metal ship-building, applicable also to steam boilers, bridges, and other structures in which metal plates are used.

482. Charles Damas Auguste Joseph Planque, merchant, of Pont St. Maxence, France. Improvements in the manufacture of fecula.

484. Edward Slaughter, of the Avonside Ironworks, Bristol, engineer. Improvements in the fire boxes of locomotive and other steam boilers.

Dated February 26, 1856.

486. James Prescott Joule, of Manchester, Lancaster. Certain improvements in steam engines.

490. James Steedman, of Albany-street, Middlesex, pianoforte-maker. An improvement in pianofortes.

492. Philipp Schafer and Frederick Schafer, of Brewer-street, Middlesex, manufacturers. An improved apparatus for damping gummed stamps, tickets, labels, and envelopes.

494. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. A composition or compositions to be used as a substitute for hops in brewing. A communication from A. Boehler and P. F. Quantin.

496. Isaac Reckitt, George Reckitt, and Francis Reckitt, of Kingston-upon-Hull, quakers. Improvements in the manufacture of starch, British gum, and size.

Dated February 27, 1856.

498. Gabriel Marie Legrand, of Rue de Bretagne, Paris, France, gentleman. Certain improvements in graining and chequering skins and woven tissues.

500. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the treatment of hard India-rubber for the purpose of rendering the same applicable to the manufacture of pens, tubes, springs and other similar articles. A communication from C. V. Steinlen, of Paris, France, engineer.

502. William Exall, of Reading, Berks, civil engineer. Improvements in the manufacture and arrangement of sawing-machinery.

504. Alexander Inglis, of the New River Head, Clerkenwell. An improvement in the manufacture of flexible bottles or cases for containing colours and other fluids and semi-fluids.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," March* 11*th*, 1856.)

2406. John James Speed, jun. Improvements in car and carriage springs.

2408. George Riley. An improved roller mill for grinding malt.

2417. Paul Emile Chappuis. Improvements in reflectors for the diffusion of artificial light.

2437. George Milner. Certain improvements in the manufacture of bedstead bottoms, part of which improvements are applicable to various other purposes for commercial and domestic use.

2445. William Henry Walenn. Certain improvements in pianofortes. A communication.

2457. James Higinbottom. Improvements in furnaces and apparatus for generating steam, whereby the smoke will be consumed and the fuel economised.

2467. William Prior Sharp and William Weild. Improvements in the reeling or winding of cocoons, and in the manufacture of silk threads, and in machinery and apparatus for these purposes. Partly a communication.

2475. Arthur Dobson. Improvements in preparing certain unbleached linen fabrics.

2483. George Baring Locke. Apparatus, apparatuses, or mechanism, for placing detonating or fog signals on the rails of railways to be exploded thereon, and for removing the same therefrom whenever required

2489. Frederic Ludewig Hahn Danchell. Certain improvements in apparatus for ascertaining the pressure of steam, air, water, or any other fluid or liquid.

2519. Cullen Whipple. Improvements in machinery for preparing and combing fibrous materials.

2525. William Henry Walenn. Certain new and useful improvements in looms for weaving seamless bags and other open double fabrics of a similar character. A communication.

2534. Henry Wickens. Improvements in locomotive steam-engines and in apparatus in connection therewith, parts of which improvements are respectively applicable to other steam-engines and purposes.

2541. Thomas Hitt. A new method of obtaining power for propelling vessels and certain new propelling machinery.

2548. Andrew Barclay. Improvements indicating the pressure of steam and other fluids, which improvements are also applicable to governors and other regulating apparatus.

2561. James Burrows. An improved apparatus

for winding coals or other minerals from mines, which said apparatus is also applicable for other similar purposes, and for machinery required for forming or constructing such improved apparatus.

2575. Franz Duncker. A new instrument for electric telegraphs, called "despatch distributor," which will permit despatches of various contents being communicated at the same time to one or more stations by means of one or two line wires only. A communication.

2582. Charles Crum and Charles Paul. Process of making bread.

2603. John Silvester. Improvements in steam gauges and safety valves.

2630. Alexandre Tolhausen. Certain improvements in bombs and other explosive projectiles whose charges are to be fired by percussion. A communication.

2672. Edward Peyton and Duncan Morrison. Improvements in the construction of metallic bedsteads and other articles to sit or recline upon.

2711. Sir Charles Edward Grey. The use of a new vegetable material for raising the nap and dressing woollen cloths and webs and tissues.

2719. William Rowan. Improvements in steam-engines.

2750. John Cornes. An improved mangle or press, parts of which are applicable to rollers employed for pressure purposes generally.

2859. Alexandre Tolhausen. An improved harvesting machine. A communication.

2872. John Hadden, Henry Hadden, Frederick John Hadden, and Charles Staunton Hadden. Improvements in circular frames for the manufacture of ribbed fabrics.

61. Edwin Thomas Trueman. Improvements in artificial palates and teeth.

86. William Pole and Frederick William Kitson. Improvements in railway wheels.

87. William Smith. Improvements in ploughs, and other cultivating implements.

163. Jean Baptiste Pierre Alfred Thierry, jun., Jean Lewis Richard, and Baron Henry de Martiny. Improvements in preventing smoke by means of a fumivore hygienic apparatus.

196. Alexandre Tolhausen. An improved machine for boring and other cutting operations in stone and other mineral substances of similar character. A communication.

215. William Spurrier. A new or improved method of attaching handles to metallic tea-pots and other vessels, which method of attachment may also be applied to the fixing of castors on furniture and other like purposes.

233. Henry Samuel King. Improved apparatus for printing and embossing. A communication.

301. Edwin Clark. An improvement in the apparatus for suspending insulated electric telegraph wires.

305. William Allen Turner. An improved preparation or mixture to be used in the manufacture of compounds of India-rubber or caoutchouc.

317. Henry Squire. An improved seal or fastening for envelopes, deeds, and documents.

369. William Edward Newton. Improvements in the manufacture of zinc. A communication.

371. Alfred Vincent Newton. Improvements in springs applicable to railroad carriages, and to other uses. A communication.

376. Thomas Parkinson Capp. An improved lamp.

380. Walter McFarlane. Improvements in building and structural works, and fittings in metal.

424. Richard Laming. Improvements in purifying gas, in preparing materials useful for purifying gas, and in apparatus to be used in purifying gas and disinfecting gas liquors or washings

448. William Clarke. Improvements in the manufacture of warp fabrics.

470. Henry Loveridge. An improvement in feet, hip, and slipper baths, also in bases for shower-baths and basins for washing, and other purposes.

484. Edward Slaughter. Improvements in the fire-boxes of locomotive and other steam boilers.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

601. George Collier.
608. John Powis and Jabus Stanley James.
612. The Honourable William Erskine Cochrane and William Marshall Cochrane.
621. William Muir.
651. Charles Heard Wyld.
657. John Livesey.
1026. William Frederick Thomas.

LIST OF SEALED PATENTS.

Sealed March 4, 1856.

2580. Duncan Morrison.
2727. Joseph Barling.
2798. Reuben Levy.
2803. Samuel Clarke.
2875. George Harvey.
2884. John Barcroft.
2922. Sylvanus Sawyer.
2946. William Lange.
10. Richard Albert Tilghman.

Sealed March 7, 1856.

2023. Florentin Garand.
2031. Eugene Hippolyte Rascol.
2033. Joseph Henry Tuck.
2106. Richard Archibald Brooman.
2113. George Arthur Biddell.
2505. William Johnson.
2821. John Henry Johnson.
2879. James Fleming, junior.
160. John Wordsworth Robson.

Sealed March 11, 1856.

2062. Joseph Partridge and John Kirkham.
2067. Pierre Bernardet de Lucenay.
2070. Joseph Henry Tuck.
2071. Abram Longbottom.
2074. William Church.
2075. Theodore Gomme, jun., and Charles Eugene Auguste Beaugrand.

2082. Joseph Gilbert Martien.
2090. Alfred Ford.
2092. Joseph Lewtas.
2114. Samuel Coulson.
2122. John Dale.
2123. George Seaborn Parkinson.
2142. Frederic Rainford Ensor.
2291. John Dewrance.
2822. George Hall Nicoll.
2856. Andrew Small.
32. William Simmons.
170. Dundas Smith Porteous.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

The communications of "J. E. B.," "J. H., of Chester," and "The Inventor of Gardner's Patent Smoke Consumer," reached us too late for insertion in this number.

F. Baldwin.—We regret that we cannot this week answer your question.

C.—Having, as you will see, inserted your letter in reply to Mr. Cheverton, we think it better to leave the subjects of your private communication as they at present stand.

E. Garnes.—Yours shall, if possible, be inserted in our next.

Amicus.—We thank you for your suggestion, which shall be considered.

J. Tallock.—Your request shall be attended to.

All letters intended for insertion in this Magazine should reach the Editor not later than Wednesday. When convenient, they should be transmitted earlier.

CONTENTS OF THIS NUMBER.

Pascal's Mixed-vapour Engines—(*with engravings*) ... 241
Faraday's Experimental Researches in Electricity—(*continued from page* 199) ... 244
Flexible Joints for Locomotive Feed-pipes—(*with engravings*) ... 247
The Causes of Explosions of Steam Boilers—(*with an engraving*) ... 249
The New Metal Aluminium ... 252
Captain Norton's Inventions ... 253
Lord Wrottesley on Instruction in Science ... 253
Handbook of Natural Philosophy:—Hydrostatics, Pneumatics, and Heat—Optics. By Dr. Lardner—(Review) ... 253
Mechanical Locomotion ... 254
Constructing Mortars and Ordnance ... 255
Gardner's Smokeless Furnace ... 255
Chattaway's Coupling and Buffing-apparatus.. 255

Specifications of Patents recently Filed:

Stanley ... Weighing-machines ... 255
Saunders ... Cloth-rollers ... 256
Woller and Butterfield ... Figured Fabrics ... 256
Bodmer ... Rotatory Steam Engines ... 256
Tilghman ... Candles ... 256
Watson ... Coke ... 256
Lane ... Gold-leaf ... 256
Bellford ... Grinding-mills ... 256
Mourguet ... Destroying Weevils ... 256
Glover ... Knapsacks ... 256
Tilghman ... Alkalies ... 256
Betjemann ... Tables ... 256
Richardson and Greenshields ... Chenille Fabrics ... 257
Hall ... Gunpowder ... 257
Avery ... Windlasses ... 257
Gilbee ... Boats ... 257
Wilson ... Cooking-apparatus ... 257
Platt & Hibbert ... Mules ... 257
Pradel ... Twisting Fabrics ... 257
Bedells ... Elastic Fabrics ... 257
Lister ... Treating Flax ... 257
Manning ... Sewerage ... 258
Tileston ... Ruling Paper ... 258
Pycock ... Curtain Fixtures ... 258
Smith ... Horse-rake ... 258
Haddan ... Cannon ... 258
Cooley ... Hats ... 258
Devy ... Hair Fabrics ... 258
Sidebottom ... Shuttles ... 258
Delperdange ... Joining Tubes ... 258
Cooke ... Moulds for Castings ... 258
Fontainemoreau ... Steam Boilers ... 258

Provisional Specifications not Proceeded with:

Bufnoir ... Stopping Bottles ... 259
Glukman ... Box for Papers ... 259
Airey and Lackabane ... Steam-Engines ... 259
Fullard ... Thatch Pin ... 259
Pfaff ... Motive Power ... 259
Ritchie ... Preparing Cork ... 259
Johnson ... Metallic Fabrics ... 259
Johnson ... Purifying Gas ... 259
Johnson ... Ornamenting Articles.. 259
Perrot ... Chronometers ... 259
Whiteman ... Waterproof Coats, &c.. 259
Anderson ... Shirts ... 259
Gedge ... Motive-power ... 260
Lilley ... Textile Fibres ... 260
Hamnett ... Shuttle Tongues ... 260
Nasmyth ... Preserving Substances. 260
Murphy ... Motive-power ... 260
Hopkinson ... Steam-Engine boilers.. 260
Baron, Lang, and Liversage ... Winding Threads ... 260
Latour ... Looms ... 260
Bachoffner ... Advertising ... 260
Provisional Protections ... 260
Notices of Intention to Proceed ... 262
Patents on which the Third Year's Stamp-Duty has been Paid ... 263
List of Sealed Patents ... 263
Notices to Correspondents ... 264

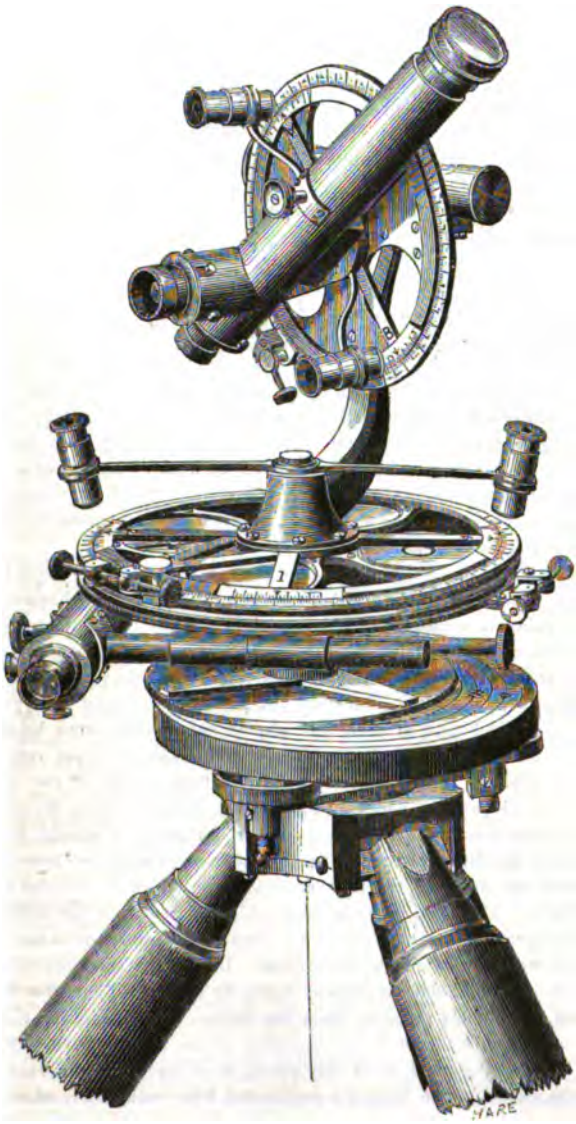
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1702.] SATURDAY, MARCH 22, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

METFORDS'S IMPROVED THEODOLITE.



METFORD'S IMPROVED THEODOLITE.

Mr. W. E. Metford, C. E., is just now introducing to the notice of engineers, surveyors, and others, a new theodolite, which combines several very important improvements, and in the construction of which great mechanical skill, and an exact acquaintance with the requirements of practical field operations are evinced. Indeed, we but seldom have an opportunity of bringing before our readers an apparatus embracing so many obvious improvements as are combined in Mr. Metford's instrument. We shall, therefore, endeavour to give, in what follows, an accurate and sufficient description both of those defects in the old instruments which are avoided in this, and of the manner in which the several improvements have been effected. But, before proceeding with the description, we wish to remark that the invention before us is the result not of a mere desire, on the part of the inventor to produce ingenious changes in the form and arrangement of the parts of a valuable instrument, without regard to important objects, but rather of a desire to place in the hands of himself and others an instrument which is adapted not merely to the floor of the instrument maker's shop, but also to the rough hill side, and the varying circumstances of wind and weather there met with. No attempt at improvement was made or contemplated until the instruments at present in use had been found more or less defective in various ways,—so far so that in some cases they would not do the necessary work at all, while in other cases they did it with much inconvenience and uncertainty, and in general necessitated a very considerable loss of time. The new design is therefore the result of the experience of an actual surveyor; this can hardly be said of the old instruments.

In order to proceed with our description with the greatest advantage, we will begin with the levelling gear, and consider each part successively, rising from the lower to the upper portion of the instrument. By this method we hope to present an account, which, with the aid of the accompanying engravings, will convey a full knowledge of Mr. Metford's elaborate invention, and one which will, perhaps, be more useful than if the several improvements were treated of in the order of their importance.

There are two kinds of levelling gear now in use. The first is common in the parallel plate apparatus. This gear, though suitable enough for levels, where horizontal twist is of no moment, is liable to become so far deranged by wear as to interfere most injuriously with angular measurements. Directly the screws wear,—which they do faster than in Everest's from the pressure which is put upon them,—a side ricketiness commences; and, beside this fault, when the plates are not parallel, the screw ends push obliquely on the lower plate, and tend to slide, and also to enlarge the screw holes in the plate at their upper and lower parts. Again, the centre half-sphere, if not very well made—and those from the best makers are not without defects—will, if the plates are put much out of parallel, jam the screws. The small distance between the two screws and the axis of the instrument is also a disadvantage, for the base should be well-spread; and if the plates are large they are necessarily very heavy, as they must be stiff enough to take the push of the four screws. The tripod in Everest's theodolite is good in principle. The three screw system, which is free from the defects of the parallel plate arrangement, has obtained in all large instruments, and is the only one that can be adopted with advantage in theodolites. But in the arrangements of Everest's theodolite there are other defects which injure its action. First, the three balls are seated in three V channels radiating from the centre; and secondly, there is a plate thin enough to spring, fitting over the haunches of the balls, and, keeping them tight on the V's. This spring-plate, as we may call it, is so made that the necks of the balls are kept at the same distance from the centre and from each other, whether the plates are parallel or no. Now if the elastic plate were removed, as the balls got out of

parallel, and the distance between the balls increased, they would get a little further from the centre, by travelling slightly in the V's. This is, however, entirely prevented by the elastic plate. It is, therefore, difficult to see what is really the use of the V's. Even were there no necessity for a spring-plate,—and this plate might be dispensed with, though with danger, as the theodolite would drop off when shouldered, if the securing of the balls were once forgotten,—directly the balls begin to grind the V's (as they soon will from grit getting in the channels) they refuse to travel. As the balls will, therefore, grind their own seats, and in doing so injure themselves to some extent, Mr. Metford prefers making a virtue of necessity, and giving three good seats instead of bad ones. He wholly prevents grit from getting in by fitting them closely to their beds, covering them with caps, and putting them upside down (and cutting the screws left-handed, so as not to interfere with the common habit, when required). To prevent the screws from becoming loose, he adopts a neat method of tightening them, and of allowing for the increasing space between the balls. He has made the three arms, that take the three screws through their end, broad, and with sufficient spring in them to permit the hollow or female screws to be slightly twisted.* By inverting the balls a reduction in weight is effected (a traversing stage, to be hereafter described, doing the part of the usual three arms). The balls are bedded in the under surface of the stage, and are secured thereto by an elastic three-cornered plate, similar to that in Everest's instruments, but having boxes on the ends to keep off dust. These boxes are sunk into the hollow heads of the levelling screws to save room; the screws can be coarser than in the parallel plate system, because they are farther from the centre.

We come next to the traversing stage, the object of which is to enable the observer to shift his instrument over the exact centre, after having set it up firmly, nearly level, and approximately over the point required.† The main hollow centre of the instrument carries a circular foot or disc, 3½ ins. in diameter, and $\frac{3}{16}$ in. thick.‡ The stage itself is also a flat disc or plate, of 5½ ins. interior diameter, in the bottom of which, as has been stated, the levelling balls are seated. The upper surface has round its edge a ring, the depth of the circular foot just described. There is a $2\frac{1}{16}$ ins. hole in the stage to let the plumb cord traverse with the instrument. The circular foot, then, being placed upon the surface of the stage, is able to traverse in any direction to the extent of 1 in. from the centre, which is thought sufficient. To secure the instrument properly there is an upper plate screwed to the ring, so that the stage becomes a very shallow box, with the foot between its top and bottom, which have two large holes through them, the lower one, as we have said, for the plumb cord, and the upper for the hollow centre. There is a washer which also keeps out dirt, and a three-arm pinching screw, running on the hollow centre, and securing the foot to the upper part of the box. In case the observer should, for convenience, have his instrument fitted by an intermediate block to smaller legs, so that the plumb-line could not travel, the upper surface of the stage is divided by rings ¼ in. apart, to enable him, after measuring the error of the bob below, to shift his instrument through the necessary space. With a circular level which, as will be hereafter mentioned, Mr. Metford employs, it is easy to place the theodolite quickly within ½ in. from its true position, nearly level, and firmly in rough ground. By means of the traversing stage and screw it may then be readily moved into its true position, and securely fixed there. It is often the case, particu-

---

* If those who use levels and theodolites were properly taught, there would be no occasion to allow for this twist, as there would be no necessity for ever having the plates more than one-fifth of an inch out of parallel; and it would be well to block the screws to prevent motion through more than three-tenths of an inch from the parallel.

† The idea of traversing an instrument is not altogether new, but the only stage heretofore used is so very cumbersome, that it is quite inapplicable for general use, and forms no part of the instrument itself.

‡ These dimensions are those of a 7-inch instrument; and are, of course, slightly reduced in the 5-inch, which size is amply large for general work.

larly in some kinds of work, that the theodolite has to be moved many times in a day. Each time, the observer, after humouring the instrument till he gets it in its right place, finds it not firm, or too much out of level; he gives the legs a push, and finds he has improved the level but moved the instrument from its place; he gives them another push and finds he has restored it to its position but interfered with the level; and so he goes on. With this instrument of Mr. Metford, however, all this is avoided. All the observer has to do is first place the foot in a central position, then, keeping his eye on the circular level, spread the legs, and let the plumb be on the required point nearly; then push in the legs alternately until the instrument is level, and finally traverse the instrument until the bob is over the exact centre, and then turn the pinching screw.

We come next to the check telescope, which, though not necessary in 5-inch instruments, or, for ordinary work, in larger ones, is nevertheless of great importance at other times. This telescope, in Mr. Metford's instrument, lies snugly between the traversing stage and the horizontal limb, where it can be used generally without taking advantage of the capability it has of sliding out; by sliding it out, however, a total horizontal and vertical range of 360° is obtained. The sliding, horizontal, and vertical motions are all fixed by one tangent screw which carries a wedge that forces two blocks, one against the hollow centre, and the other against the spindle of the check telescope. The idea of sliding the telescope out was suggested to the inventor during a conversation with Mr. Newnham, C. E. of the Scinde Railway.

The horizontal limb, with its pivots, vernier circle, &c., comes next under our notice. This limb is generally constructed solid, as is the vernier plate also. Mr. Metford has, however, so arranged the limb in this instrument that it takes the compass, a level with a circular bubble, and two memorandum slates on which constant errors, &c. may be recorded, thus saving weight, and making the work very compact. The vernier plate is carried on four arms and a diagonal brace, to which latter the tangent motion is attached. This brace prevents the slight twist in these arms which would occur without it. The limb is divided to degrees and fifths, and numbered right and left for convenience. The verniers are also made to read right and left, and are therefore double. By a simple but ingenious arrangement they are made to read to decimals of degrees or minutes, and to seconds also; thus: the verniers are divided to read to 12″; 12″ is 0·2 of a minute; again, 12′ = $\frac{1}{300}$th of a degree, and 3·$\frac{1}{300} = \frac{1}{100}$, or ·01 of a degree. The third division strokes are therefore carried up a little farther than all the rest, except the minute strokes, which are longer still. This arrangement is useful in many ways; among others in ranging curves on railways.

The circular bubble was first used by Troughton for obtaining an artificial horizon; and it may be concluded that if he thought it sufficiently accurate for that purpose, it is accurate enough for levelling the theodolite, if as carefully made as the long level. This, on comparing the two, Mr. Metford finds to be the case. The great advantage of the circular level is, that it shows exactly the direction in which the level is departed from (which the bubbles of the common instrument do but imperfectly), and is thus a great aid in setting up the instrument before adjusting the traverser. The horizontal limb has openings which enable the observer to take vertical angles to 70° in depression; and the traverser can be made to overhang the limb when an angle of that kind is to be taken. The pivot, which is hollow, has attached to it very securely, an arm to take the lower tangent apparatus. The ball system of tangents is adopted to prevent the loss of time occasioned by the wear of the common tangents. All the pivots have broad bearing flanges, like those used in levels, by Mr. Gravatt, which stiffen the whole instrument very greatly, and the pivots themselves and the bearing flanges are in one casting. The conical pivots fit in their sockets throughout their length, and not at their ends only.

The next feature we come to is the means adopted for supporting the whole upper works. On ot the side of the main pivot is attached a strong curved bracket, divided into two arms at the top. This bracket has a T section throughout, and on the ends and at the junction of the arms is fixed the vertical circle. The idea of employing a curved bracket for upholding the upper works of the instrument occurred to Mr. Metford in consequence of his having experienced great trouble in taking angles from near objects, with a small altitude and azimuth instrument, in which the telescope was at some distance from the centre. The improvement is unquestionably an important one, since by it the suspension of the telescope over the axis of the instrument is permitted. The use of the curved bracket is not attended by weakness, for the bracket is exceedingly stiff, and has been used by Mr. Metford for six years with perfect success. The microscopes hang on the head of the casting, and travel far more conveniently than in the common instrument.

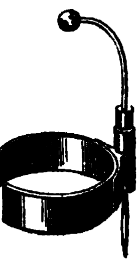
The vertical limb is fixed to the three points by screws, and is made vertical in the construction, unless an adjustment is preferred. It is divided like the horizontal, except that it is, of course, numbered to ninety degrees four times, as is usual. The verniers, which are not four in number, but two, are like the others, and attached by a flange to the pivot, as in the case of the horizontal ones. The vertical limb is of smaller diameter than the horizontal one, because the latter is the more important; it nevertheless reads easily to 12″. There is a long level attached to the vertical limb, for use in taking vertical angles and latitudes; and three holes are cut through the limb to lighten it, and to let the bubble be seen through. The transit telescope is not fixed by a bed to the solid pivot, as Mr. Metford considers that quite unnecessary, although it is a very common plan; he thinks the brass tube of the short telescope is amply stiff enough of itself, and therefore solders a block on to it, and screws the pivot to the block. The holes through the pivot flange are slightly slotted, in order to get the telescope horizontal, and the verniers at zero. The microscopes travel or are pivoted on a seat under the block.

The telescope itself is a dumpy, and care has been taken to have all its surface of object-glass of good defining power. The eye end passes clear over the axis, and the instrument may therefore be used as a transit. By this capability of turning right over it is of immense service in ranging railway curves, as regards accuracy in laying the tangent, as well as regards time; it is also necessary in tunnelling, and in all altitude and azimuth observations, for which the instrument is perfectly adapted.

A rectangular eye-piece is added to the telescope. It is, of course, necessary for much of the work before alluded to, and is a great convenience in many awkward positions. The eye-piece is put on one side of the axis of the telescope to balance the object end. It pulls out when the other eye-piece is used, and a stopper is put in its place; it need not, however, be entirely removed. The rays are turned with a prism, so that the loss of light is trifling, as is well known.

The diaphragms are much improved. Each consists of two independent discs, and each takes one cobweb, and is so constructed that each web can be put vertical or horizontal, as the case may be, and in the axis of the telescope also, independently of the other. They are very simple in construction, and cheap to make, there being no dovetails.

An excellent contrivance, shown in the small engraving, is used for illuminating the



webs. For this purpose a small glass or other bead or sphere is placed about ¾ in. beyond the object glass, and just within its edge; a light thrown on any point of the near hemisphere of it gives a mild faint light down the telescope. The beauty of this arrangement is that the head or sphere is very easily lighted up. As long as the light falls on the near hemisphere a ray is sure to be sent down upon the eyepiece. In this sort of instrument, which is not so much an altitude and azimuth as a theodolite, this method of lighting the web—very easy to manage, very pleasant in its action, and very efficient in affording the means of varying the intensity of the light (a point of no little value)—is better adapted than the means applied to a transit or other large instrument, which could hardly be applied at all without clumsiness. The bead or sphere is held on a curved wire, and in a cork-lined tube attached to a collar that fits over the object end on the cap seat.

The object glasses are put in their cells backwards; or, rather, the thin brass edge that is burnished over the glass is outside instead of inside. This allows the glass surface to project beyond the brass cell, so that the rain and dust can be wiped off in the shortest time, and with the least amount of scratching; and the difficulty experienced in getting rain and dust off the common deep-seated glasses is wholly avoided. The deep seats do not at all shade the glasses, and the more a glass is wiped the more it is scratched. The object-glasses are cemented with Canada balsam, and white-leaded into the cells, to prevent the possibility of their moving in their seats, whereby the whole adjustment of the instrument

would be deranged. The eye-pieces are mounted in the same way, but have, in addition, short tubes projecting from the mountings, in which tubes corks are lightly placed to keep out rain. The eye-piece block—that which stops the end of the telescope barrel—pulls out, and the cobwebs and diaphragms are thus exposed.

Having thus described the several principal improvements in the instrument itself, we may further mention that an improved method of mounting it upon its legs has also been adopted by Mr. Metford. We will not here describe the defects of the present joint, in which no suitable means are provided for counteracting the injurious effects of wear, but content ourselves with mentioning that Mr. Metford has used the joint applied by Mr. Froude to his levels; this joint resembles an inverted mortar, into which the legs are screwed. The details have, however, been improved by Mr. Metford.

The instrument is packed thus: a square board has formed in it three holes, in which the ends of the levelling screws lie; and three nuts, sunk flush into the board on its under side, fix the instrument to the board. The board slides into a box, tapered vertically, and is secured by running in a groove. The door of the box is then shut and the board and instrument are firmly fixed. There is above the instrument a shelf on which the ball reflector, table of errors, &c., may be placed. The bob is attached to the cover. A leather strap runs round the box, and carries between its ends a handle of wood, turned to fit the hand. By this handle the whole is conveniently carried.

It must be admitted that any considerable addition to the weight of the theodolite would be very objectionable. No objection on this ground can, however, be brought against the improvements introduced by Mr. Metford; on the contrary, a positive reduction of weight, of at least ten per cent., results from their adoption. A careful comparison of the weights of the common instruments will be found to confirm this statement.

We have now shown that Mr. Metford has produced an instrument which possesses a capability of horizontal motion—great steadiness in use—great range of vertical circle—small comparative weight, and numerous other advantages; and to this we may add, that it is of a very light and symmetrical appearance, (as may be seen by the engraving on the front page,) and is entirely free from the "top-heaviness" which is usual in the common instruments. We think, therefore, the favourable opinion of Mr. Metford's invention expressed at the outset of our remarks will be fully shared by our readers. It only remains for us to add, that the maker of the instrument submitted to our inspection, is Mr. T. D. King, of Bristol, a very skilful philosophical instrument maker, to whom Mr. Metford expresses himself indebted for several useful suggestions made while carrying the foregoing improvements into effect, and whose work is of the highest class, and does him the greatest credit.

TATLOCK AND HOSTAGE'S RAILWAY CHAIRS.

Messrs. Tatlock and Hostage, of Chester, have taken steps to obtain a patent for an improved railway chair, which is to be called a "slide and tongue chair."

Fig. 1, of the accompanying engravings, is an elevation of the improved chair when fixed; the dotted lines show the slide-tongue and cotter; fig. 2, is a view of the fixed part of the chair; fig. 3, is a view of the slide and tongue part of the chair; and

Fig. 2.

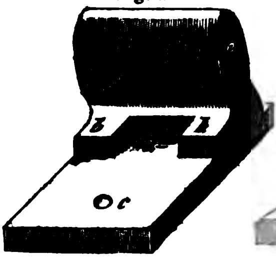


Fig. 3.

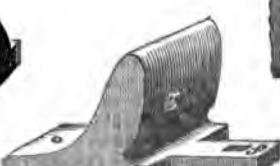


Fig. 4.

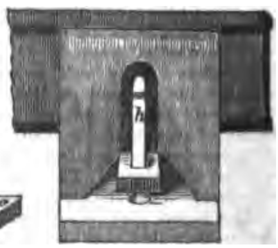
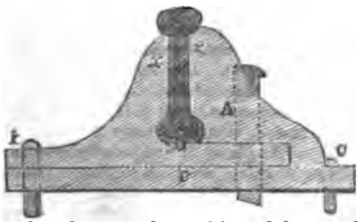


fig. 4, is an end view of the chair, showing the mode of cottering, &c. The fixed part, fig. 2, is cast with a seat for the rail, and a cheek or solid abutment to fit the outside. In laying, this is fastened to the sleeper, in the first instance, by the spike, *a*, fig. 1. The immediate seat of the rail or rails, *b*, *b*, is elevated about an inch above the top of the lower plate, *c*, of the chair. There is a space or opening, *d*, in the centre of this

seat, and extending under the fixed cheek, *e*, for the admission of the tongue in the other part of the chair, *f*, fig. 3, which space is about two inches wide, by one inch deep. The slide portion of the chair, fig. 3, is also formed with a cheek, *g*, to fit the rail, and furnished with a projecting tongue, *f*, to fit the space, *d*, described in the other portion of the chair, and extending so far beyond the outside of the cheek in the fixed part, as to admit a wedge or cotter of wrought iron, *h*, fig. 4, to be driven down vertically through a slot both in the tongue and bottom of the chair, and some distance into the

Fig. 1.



wooden sleeper; the position of the two slot holes being such as to allow the wedge to draw the whole up tight. The usual spike, *i*, fig. 1, then secures the slide and bottom plate to the sleeper in the ordinary manner. A thin piece of felt, *x*, fig. 1, will remedy any slight inequalities in the ironwork. The "tilt" of the rail to meet the wheel-tyre may either be provided for in the chair or by adzing the sleeper.

The tongue of the slide piece can be made slightly bevilled outwards at the bottom and its socket in the fixed piece to correspond, by which means greater steadiness will be imparted to the chair, and roughness in the castings will be of less consequence. The cotter is secured from rising, either by a split in the upper part of the cotter itself, or by a small spring welded into it, which split or spring falls into a rack on one side of the cotter (see plan). But this plan of securing the cotter is not considered at all necessary, as, from the very slight taper of the cotter, and its being driven some distance into the sleeper, it is almost impossible for it ever to work loose — especially when it is considered that nearly all strain is taken off the cotter by the spike, *i*, which is driven through the two pieces of the chair.

The weight of these chairs exceeds that of the ordinary joint chairs by two or three pounds, and for intermediates the chair can be reduced so as to bear a similar proportion to the present intermediate chair.

The inventors give the following as a summary of the advantages supposed to result from the employment of their improved chair:

"1st. The temporary and imperfect expedient of wooden keys with its constantly recurring expense, is for ever avoided.

"2nd. It is impossible for the rails to rise in the seat; the unyielding iron constantly pressing on the lower flange of the rails, preventing it. Neither can there be any lateral motion, and a thin layer of felt is at any time a simple, inexpensive, and perfectly efficient mode of remedying any defects in the ironwork.

3rd. While the ends of the rails are held together as firmly as in a vice, there is no obstruction to longitudinal expansion; a disadvantage experienced in every method where the rails are rigidly tied together.

"The primary object of this invention," they say, "is for the joint-bearings and fastenings, but it is equally applicable for intermediates. By the method of fishing (although a good and secure joint is made in the first instance,) yet the constant wear and vibration of the traffic cause an enlargement in the holes in a few years, which necessitates redrilling the rails and side-plates—new bolts—in fact, almost a renewal of the whole workmanship at great expense. It is therefore submitted that the patent slide and tongue-joint chair will prove at least as effective as the fish plan, while it is about a quarter the first cost, and can never afterwards require other attention than perhaps a slight blow on the head of the cotter. And as regards intermediate chairs;—for all new work the cost of adopting this patent would be little more than the ordinary forms of chairs fitted with the wooden key; whilst the saving in maintenance would be considerable. Indeed, the wooden key plan must always be regarded as temporary, and the permanent ways of the kingdom will not be complete until they are fitted with a *permanent* substitute."

THE CAUSES OF EXPLOSIONS OF STEAM BOILERS;

AND MR. W. K. R. HALL'S METHOD OF PREVENTING THEM.*

The discussion on the above subject reported in our last number was renewed at the following meeting of the Institution of Civil Engineers, and was continued throughout the evening.

A new form of boiler was exhibited, and described as having been recently erected at the works of Messrs. Humphrys, Tennant, and Dykes; the fire-box, of 8 feet

* A description of this invention, fuller and more elaborately illustrated than that given in the article on this subject in our last week's No. follows this article.

diameter, was composed of a series of flanged rings of Low-moor iron, fastened together in such a manner as that the rivets should be surrounded by water, and not be exposed to the action of the fire. The depth of water over the fire-box would be double that over the small iron flues, or tubes, which were 3 inches diameter. No double thickness of plate was allowed anywhere. It was intended to supply steam of 70 lbs. per inch, and it had been loaded up to 120 lbs. per inch. The shell was much stronger than that of one of the Great Western locomotives, and it was anticipated that the steam might be permitted to accumulate without danger.

Several instances were given of explosions of locomotive boilers presenting many apparent peculiarities, which were, however, all referable to natural causes; in some cases a series of very peculiar circular holes, and in others grooves were found, extending all round the interior of the shell near the rivets. The boilers had failed below the part where they were weakened by the bending over, probably a little too sharply, of the plates.

When it was remembered that the explosion of a boiler, under a pressure of 140 lbs. per square inch, was nearly identical with that of a 10-inch gun, the effects of such an occurrence were not surprising.

In the cotton mills, the speeds of the machinery were increased, whilst the boillers became weaker from wear. Under such circumstances, the occurrence of accidents was scarcely to be wondered at. When steam ceased to act merely by pressure and began to exercise momentum, peculiar effects must be anticipated; but they might be all traced to general rather than to occult causes.

It was stated that nearly, if not quite, all the instances of explosions recorded in the Journal of the Franklin Institute, were from boilers with under-firing; and they were generally considered in the United States as less secure than those with internal fire-flues.

It was stated, relative to the explosion at Sheffield, that it was proved there had been a sufficiency of water over the tube, and yet that one portion of it must have been red-hot; at least such was the appearance exhibited. It was contended that the effect of heaping up the water from the action of the side-plates was not nearly so probable as the repulsive action of the top of the flue previously contended for, inasmuch as the latter action was more probable and natural. Also that if, as had been stated, the water below the flue was unduly cooled at that part, the steam would be weak and deficient in quantity. It was reiterated, that if a boiler was of due strength, properly set, and carefully attended to, there was little danger of explosion until the plates were too much weakened by wear and tear. With all boilers Mr. Hall's apparatus would be a valuable adjunct, and in no case could it be prejudicial.

The double-flue Cornish boiler was mentioned as being preferable to the single firing-flue; the surface exposed was more extensive, and the construction was stronger, the depth of water above the flues was greater, and firing could be alternate. All these were admitted advantages.

It was reiterated that it was not necessary to have recourse to the spheroidal theory—to the decomposition of water—or to any highly scientific arguments, and much less to mysterious or occult causes for the reasons of explosions. Careful investigation would in general point sufficiently clearly to them when the reasons were fairly sought for.

It was stated, that the observed cases of corrosion of the plates of boilers might be referred to galvanic agency, and instances were given of such effects being produced, when the bilge water was taken up by the feed-pumps and injected into the boilers. The sections of metal torn asunder frequently presented proof of an instantaneous generation of explosive power, whether produced by overheated plates, or any other cause; and as the method of discharging the water and the steam from the boiler would appear to be the most effectual mode of preventing danger, it would be only reasonable to employ so simple a precaution as that afforded by Mr. Hall's apparatus.

The opinion as to the little confidence to be placed in self-acting apparatus, in general, was agreed with; but it was submitted that the self-acting looms, and other machines of that class, and the automatic action of the excentric upon valve gear and other similar arrangements, would warrant deviation from the rule, under certain circumstances, among which it was claimed to place that of the spontaneous discharge of the water and steam from the boiler, in case of a dangerous degree of pressure being attained.

The experiments of Watt and Southern were alluded to, as demonstrating that the latent heat of steam, at high temperatures, was progressively converted into thermometric heat, and the injection of water into surcharged steam would occasion a proportionate increase of pressure. A careful investigation of this subject would probably confirm the alleged result of the experiments undertaken for Mr. E. K. Collins, of New York, which appeared to be, that a saving of nearly 50 per cent. of fuel might be made by the use of surcharged steam.

The decomposition of water on heated plates, although admitted to be an interesting chemical study, was now generally rejected as a practical solution of the question of explosion; and as to the spheroidal theory, any such pressure of steam as must exist within a boiler, would practically force the water into absolute contact with the heated surface, and would not permit the globules to be suspended amidst the film of steam, at atmospheric pressure, as in an open crucible, or on a plain heated plate. Therefore that theory must almost be abandoned in practice.

The causes of explosions might, at first sight, appear to be difficult of discovery, but careful investigation generally brought to light evidence of some condition of the boiler under which an accident would be inevitable. The difficulty of arriving at the facts was great, after the occurrence of explosions, but there were few cases which did not exhibit undue weakness in some parts of the boiler, or undue steam pressure, without adequate means of affording relief.

In the case of the explosion of the locomotive boiler which had been mentioned, it was well ascertained that the cross stays upon the firebox top were rather too short, and thus had their bearing inside, instead of upon the exterior periphery. Explosions might be generally attributed to equally simple causes, and it was impressed on the meeting to seek for them, rather than to raise theories upon some occult causes, the existence of which was very problematical.

Mr. Hall's apparatus might, with advantage, be applied to all boilers, but it would be more useful if, as an invariable adjunct, it could take with it a careful intelligent fireman, without which no boiler could be considered safe.

[If the word "elsewhere" is introduced in the 9th line of the second column, on page 251 of our last Number, the sentence of which it forms a part, and which is now likely to produce a false impression, will be rendered clearer; the object of the speaker being to point out the fact that Cornish boilers, which have the fire-places within the flues, are more properly constructed in other respects than most other boilers which have the fire-places similarly placed.]

HALL'S SAFETY-APPARATUS FOR STEAM BOILERS.

In order that our readers may possess a more complete account of Mr. Hall's invention than was contained in his paper, published in our last week's number, we have prepared the following description and illustrations:—

Fig. 1.

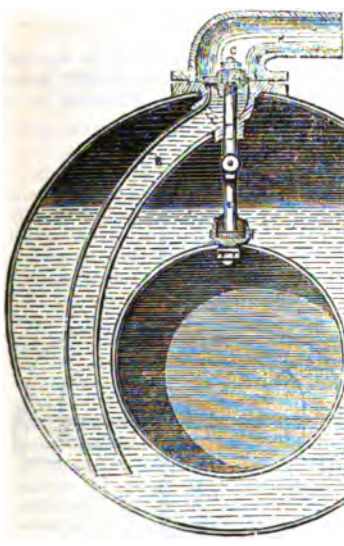


Fig. 2

The object of the invention is to discharge the water and steam from a boiler, when, by negligence or otherwise, the surface of the water has fallen to a dangerous extent, and allowed the boiler to become overheated; and the invention consists of a valve com-

municating with the water and retained in its seat and kept closed by a float and weight, and by a rod soldered at one or more points to the heating surface of the boiler.

When the surface of the water has fallen below the flues, the valve is released by the working of the float, or by the melting of the solder or fusible metal employed to detain the rod, and opened by the pressure of the steam, and the water and the steam are then blown from the boiler.

The accompanying engravings represent the valve and its connections. Fig. 1 is a section of an ordinary cylindrical boiler with a single internal flue fitted with the apparatus. Fig. 2 is a side elevation of the apparatus as applied in the preceding fig. A is a valve communicating with the water in the boiler by a pipe; B, C, D, E is a rod serving as a stem to the valve, A, made in two parts jointed at D, for convenience of construction, and terminating at its lower end, E, with a button or flange; the upper end, C, of this rod or valve stem is cut with a screw thread and furnished with a nut, by

Fig. 3.

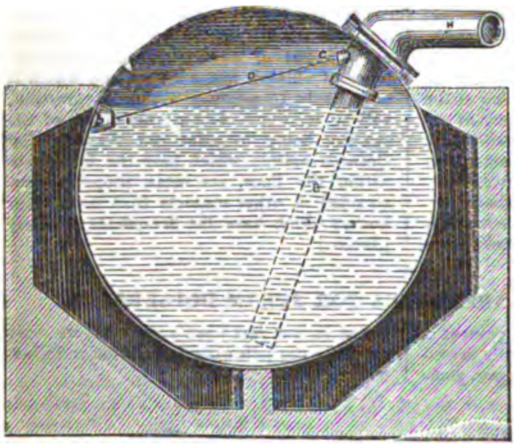


Fig. 5.

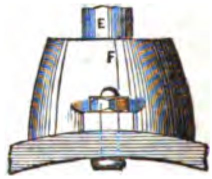


Fig. 6.

which the valve may be secured tightly in its seat; F is a cup, bolted or otherwise fastened to the upper portion of the flue, in which the valve stem, C, D, E, is secured with tin or any other readily-fusible metal alloy or other compound. When the tin in

Fig. 4.

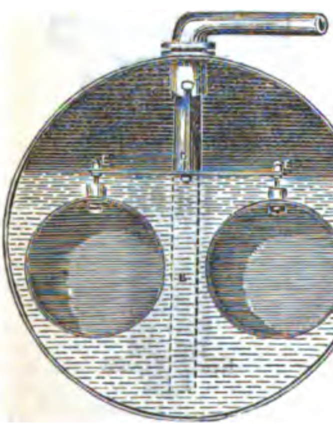
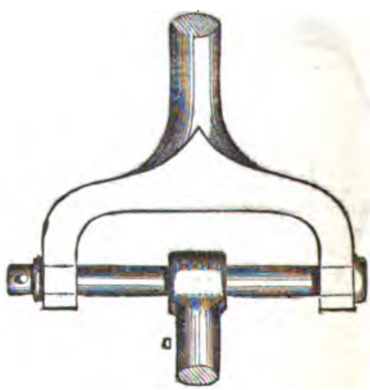


Fig. 7.



the cup, F, is melted, the valve, A, is opened by the pressure of the steam and the water and steam discharged from the boiler through the pipe, B.

The cup, F, should be made of copper or other good conductor of heat, and should be placed in the position first exposed to the action of the heat, by the falling of the surface of the water, or in any other position whereby malformation of the boiler or otherwise the plates are most likely to become unprotected, by water, from the action of the fire; a washer of vulcanized India-rubber is placed under the nut on the valve stem by which the valve is secured to its seat for the purpose of compensating by its elasticity for any difference in the expansion of the boiler and its flue; and H is a pipe, by which the water and steam, when discharged from the boiler, may be employed to extinguish the fire, or conduct it to any other part that may be desired; the pipe, B, may also be used as the outside feed pipe from the force pump.

Fig. 3 represents the application of the invention to a boiler with external flues. Fig. 4 shows its arrangement when applied to a boiler with two internal flues. Figs. 5 and 6 show a form of the cup, F, for holding the fusible metal with which the valve rod is secured in a manner different from that shown in figs. 1 and 2. Fig. 7 is a modification of the joint, D, in the valve rod, C, D, E, by which the inequalities of expansion may be compensated for by the elasticity of the joint pin, independent of the ring of vulcanized India-rubber represented in fig. 1. The same purpose may be accomplished by the use of an ordinary helical spring.

ON THE THERMAL EFFECTS OF FLUIDS IN MOTION.

BY PROFESSOR W. THOMSON, F.R.S., AND J. P. JOULE, ESQ., F.R.S.*

A very great depression of temperature has been remarked by some observers when steam of high pressure issues from a small orifice into the open air. After the experiments we have made on the rush of air in similar circumstances, it could not be doubted that a great elevation of temperature of the issuing steam might be observed as well as the great depression usually supposed to be the only result. The method to obtain the entire thermal effect is obviously that which we have already employed in our experiments on permanently elastic fluids, viz., to transmit the steam through a porous material, and to ascertain its temperature as it enters into and issues from the resisting medium. We have made a preliminary experiment of this kind, which may be sufficiently interesting to place on record before proceeding to obtain more exact numerical results.

A short pipe, an inch and a half diameter, was screwed into an elbow pipe inserted into the top of a high pressure steam boiler. A cotton plug placed in the short pipe had a fine wire of platina passed through it, the ends of which were connected with iron wires passing away to a sensitive galvanometer. The deflection due to a given difference of temperature of the same metallic junctions having been previously ascertained, we were able to estimate the difference of temperature of the steam at the opposite ends of the plug. The result of several experiments showed that for each pound of pressure by which the steam on the pressure side exceeded that of the atmosphere on the exit side there was a cooling effect of 0·2 per cent. The steam, therefore, issued at a temperature above 100° per cent., and, consequently, *dry*; showing the correctness of the view which we brought forward some years ago* as to the non-scalding property of steam issuing from a high-pressure boiler.

* Abstract of a paper read at the Royal Society.

* See letter from Mr. Thompson to Mr. Joule, published in the *Philosophical Magazine*.

TOPHAM'S APPARATUS FOR PREVENTING STEAM-BOILER INCRUSTATIONS.

Mr. E. Topham, of Nottingham, has patented an apparatus for clearing out the sediment from the water in steam-boilers, and preventing incrustations from forming in them. This invention consists in adapting to the interior of steam-boilers, and at or near the bottom and angles thereof, certain apparatus designed for the purpose of agitating and drawing off the water in the boiler occasionally, so as to prevent incrustation occasioned by the adhesion of the sediment contained in the water to the boiler. The apparatus consists of a shallow scraper, fitting loosely within the boiler, and having one, two, or more rods attached thereto for actuating the same from the outside of the boiler, these rods passing through glands or stuffing-boxes of the ordinary kind, by which they are kept water-tight whilst in action. At the back end of the bottom of the boiler there is an opening, beneath which is affixed a pipe for carrying off the sediment which has been precipitated from the water in the boiler during the day, the discharge of the sediment being effected by the attendant moving the before-mentioned scraper to and fro, by means of a suitable handle or wheels affixed to the outer ends of the rods to which the scraper is attached; or, if necessary, the scrapers may be actuated at stated intervals of time by a steam-engine.

As, however, the frequency with which the scraper is required to be used will depend greatly upon the quality of the water, it must be left to the discretion of the workman in charge of the boiler to use it as often as he finds it necessary; for general purposes about once in every twenty-four hours will be found sufficient.

FINCH'S IMPROVEMENTS IN DISCHARGING MATERIALS FROM WAGGONS.

In tipping railway, tramway, and other waggons, an apparatus has sometimes been used which consists of a frame, on to which the waggon is run. On the under edges of the sides of this frame are formed curved surfaces or rockers, on which the frame rocks sufficiently to tip the contents out of the waggon, and the rockers are so arranged that when the full waggon is run on to the frame the centre of gravity falls outside the bearing points of the rockers, and therefore the tip takes place; but, when the waggon becomes empty, the position of the centre of gravity is so changed that the frame and waggon return to their first position.

Mr. Finch, of Chepstow, has recently improved upon this arrangement by an invention which consists in applying breaks to frames of this description, so that the waggon may be held in place when tipping, or be prevented at will from tipping; and, so as to avoid any violent action on the return and delivery of the empty waggon; and also in using detached rockers, that is to say, rockers not forming one piece with the side frames. These detached rockers are fixed by bolts and nuts to the side frames in such manner that the position of the rocker can be adjusted to suit the size of the waggon to be tipped.

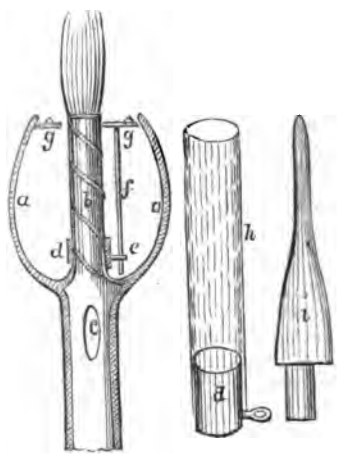
STEVENS' IMPROVED STEAM-BOILERS.

Mr. J. Lee Stevens, the patentee of the smokeless furnaces bearing that name, has recently obtained a patent for an improved combination of the parts of a steam-boiler, by which atmospheric air is to be more advantageously applied and combined with the products of combustion than heretofore. For this purpose, in constructing a steam-boiler, there is formed a water-space above the furnace or furnaces, and above this water-space a return flue or flues, through which the products of combustion from the furnace or furnaces pass to a chamber, which may be called the igniting-box. From this chamber or igniting-box the tubular flues pass to a chamber-flue or uptake at the opposite end of the boiler. In the front of the igniting-chamber is an opening, which is covered by a double door or cover, provided with numerous holes or passages, through which streams of air pass to the igniting-chamber, and mix with the products of combustion before they pass to or through the tubular flues. At the back there is a door lined with fire-brick; hence the tubular flues are accessible at both ends, and may be readily cleaned.

AN IMPROVED CHEAP OIL LAMP.

To the Editor of the Mechanics' Magazine.

Sir,—I beg to submit to you the accompanying description of a cheap oil lamp, *a* is an oil lamp to fit into a candlestick, &c.; *b* a hollow argand tube; *c* two or three openings in stem to supply air to tube; *d* small tube to carry the cotton to work up and down the argand tube, by means of the wire of which, when passed through the ring, *e*, and turned round by the revolving top, *g*, it draws it up by means of the spiral groove in the argand tube, raising the cotton at the same time. There is a pin inside



the tube, *d*, to work in the spiral groove, *b*; *e* is a ring fixed to cotton tube for the wire, *f*, to work up and down in loosely; *f* a wire fixed to moveable top; *g* a moveable top to turn round with firmness on the lamp; *h* a cotton to fit loosely over tube, *b*; *i* a stick to fix the cotton on its tube.

I find if the cotton is put over the argand tube, *b*, so as to fit easily, it may be drawn up without much difficulty by a pair of scissors or tweezers made to grasp it; but as the addition of the spiral and wire cannot add much to the expense, I think it would make it much easier to trim.

I shall, however, be very glad if any of your correspondents will suggest a

cheaper and simpler means to raise the cotton, as my object in forwarding the annexed diagram for your inspection, and (if you think it suitable) for insertion in your Magazine, is to induce a practical lamp maker to endeavour to improve those disagreeable things with flat wicks, called "lamps for the million," which smoke so much that they are offensive, unwholesome, and unfit for the poor to use in a room.

I am, Sir, yours, &c.,
E. Garnes.

Beauvoir-town, Kingsland, March 10, 1856.

P.S. A small lamp glass, four or five inches long over it, leaving a space of about three-eighths of an inch from the bottom, will give a brilliant light.

THE SMOKE QUESTION.

To the Editor of the Mechanics' Magazine.

Mr. Brandram's answer* does not, I apprehend, in any measure remove the argument from the position in which I at first placed it, and in which it must remain while the laws of chemical combination are unaltered. That the visible nuisance common to factory chimneys can be removed by the plan Mr. Brandram mentions I have not denied; the only query remaining in an unsatisfactory state is "economy of fuel." I stated in my last, when referring to the "double fire question," "They do not inform us at the same time whether this is economically effected, *whether the quantity of work yielded by a given weight of coal is what may be considered efficient*, or whether indeed the use of double fires is attended with a greater or less consumption of fuel." The reply of Mr. Brandram only refers us back to a former letter of his, wherein he states the saving over the original plan of ordinary fires, by the use of double furnaces, is twelve per cent. In the same letter Mr. Brandram stated that boilers calculated to work at 50 or 60 lbs. pressure per sqaure inch with smoke, could only produce steam of 40 or 45 without smoking. Now the former smoky condition is the original; and here at once is a considerable loss consequent on the smoke removal; but perhaps Mr. Brandram's estimate of 12 per cent. is from the original working condition of the fire with smoke, and their now present condition without smoke, the same effective power being given out. The 12 per cent. still leaves a considerable quantity of fuel unaccounted for. It is taken, and not with a large amount of exaggeration, that if a ton of coals be consumed in an ordinary furnace in an ordinary way, at least one-fourth (some state) one-third escapes by the chimney; taking the lowest estimate, this would be 23 per cent. loss of effective fuel, and the double furnace plan has, in a slight measure, remedied this. But if perfect combustion is effected, what becomes of the remaining? It does not escape visibly, or it would be seen. That it does escape is certain, and in the manner and condition we have already stated. There is one other fact in connection with "double furnaces," at least proved most fatally unfit in one instance; I refer to Messrs. Hall and Boyd's unfortunate catastrophe, wherein their use of an internal fire-place, or "tubular boilers" cannot be persevered in without running considerable danger and risk of explosion. This may not be the case with Mr. Brandram's contrivances, but it is well that all points should be perfectly understood. I am corrected in my relation of the operation of *smoke prevention, not consumption*, at Cubitt's works; but it appears to me that the mere creeping in of the word "over," instead of "through," is not a mistaken notion, but a typographical error, which could not, nor does it alter the principal sense in any manner: the plan, as stated by me at Cubitt's, is the cooling down the heated gases and the consequent deposition of the soot mechanically suspended. It is not impossible, as I have found by experience, to make an ordinary furnace and boiler give out the full effective work without smoke, as was supposed impossible by Mr. Brandram; having fitted an apparatus to a boiler of 55 or 60 horse power, as the London Zinc Mills, City-road, and that after several other plans had been ineffectually attempted; I have the satisfaction of being informed that it answers its purpose admirably, that steam is generated more quickly, fuel much economized, and without the slightest inconvenience as regards "smoke." This, I would also remark, is not consequent upon the interposition of Welsh or anthracite coals, as in one instance, upon visiting to inspect a patented apparatus, I found was the case. I did hope to have concluded my former article this week, but feel called upon to make a reply to the letter I am now noticing, and must again therefore ask a continuance of your repeated kindness.

I am, Sir, yours, &c., The Inventor of Gardner's Patent Smoke Consumer.

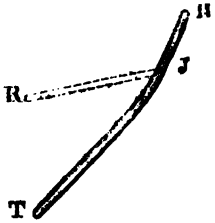
* See No. 1700, p. 231.

HYDRAULIC INQUIRY.

To the Editor of the Mechanics' Magazine.

Sir,—I shall feel much obliged by your inserting the following as soon as convenient. "H is a stone reservoir of water, and H J T the direction of a pipe 9,660 feet long, which is laid beneath the surface of the earth, and gradually declines in ele-

vation from H to T. The diameter of the pipe from H to J, a distance of 2,827 feet, is 9 inches; whilst the diameter from J to T is 10 inches, and the difference in level between H and T is 188 feet. Now it is found advisable to take a small supply of



water to a reservoir at R, the distance, J R, being 3,910 feet; the difference of level between H and R is 100 feet, and between H and J 98 feet. The pipe, H T, after arriving at T, has to supply, by means of branch pipes, a district $1\frac{1}{2}$ miles in diameter, varying in elevation from 53 feet below to 173 feet above the point T. It is required to ascertain whether such a pipe as H J T can be tapped at all without affecting its distributing powers; and if it can, to what extent may it be tapped at the point J."

Hoping that some of your able practical correspondents will furnish an early reply,

I am, Sir, yours, &c.,

J. E. B.

Burnley, March 12th, 1856.

MECHANICAL LOCOMOTION.

To the Editor of the Mechanics' Magazine.

Sir,—Will you allow me to make a few observations respecting the much-disputed point, "What is the fulcrum in the locomotive engine?" If, as one disputant says, the rail is THE fulcrum, then the engines of a locomotive could not turn the machinery when lifted off the rails, which we know is not the case. Again, supposing the axle of the driving wheel the fulcrum, why should not the engine advance when raised from the rails? This being an impossibility, my view of the subject is this:—The fulcrum through which the power of the cylinders is transmitted to the driving wheels is undoubtedly the axle of the driving wheels, and is the only fulcrum necessary for simply turning those wheels; but when it is required not only that the driving wheels should revolve, but that the whole machinery should advance, it appears very clear to me that another fulcrum is needed, and that the other fulcrum is the rail.

I hope Mr. B. Cheverton will give his opinion on this view of the subject, as I am sure, from his letter, it is in principle the same, only differently expressed.

I am, Sir, yours, &c.,

J. H.

Chester, March 12, 1856.

THE GLASS DIAL CLOCK.

To the Editor of the Mechanics' Magazine.

Sir,—I recollect, some years ago, one of the mechanical wonders described in your useful pages was a singular time-piece, apparently consisting only of a glass face, with hour and minute hands, but without any other apparent works to give the motion to the hands than such as might be concealed in the hour hand.

Mr. Malcomb, the clever exposer of wizard tricks, &c., at the Panopticon, is now exhibiting one of these, of a large size, in his pleasing and instructive lecture, in that institution; but he does not explain its construction, for commercial reasons, I suppose. At any rate, it is an object which must excite considerable attention and thought.

Mr. Malcomb draws the plate glass on which the dial face is painted out of its wooden supporters, showing that it has no connection with them. At this time the hands are not placed in the centre; merely a small hole is visible. He afterwards applies an axis, and by a pinching screw socket, fixes it by means of two vulcanized India-rubber discs tight on the glass. He then first applies the hour hand, and gives it a twirl round, showing that it revolves freely on the axis; and the wonder is that it gradually settles itself, after several pendulous vibrations, to the exact hour of time. He then fixes the minute hand, giving that a quick circular motion, showing apparently that it has no connection with the axis, further than being suspended upon it, as, after several revolutions and pendulous vibrations, the handle settles to the minute; and, what is more surprising, the hands progress, keeping the proper time. At any rate, it is a very clever piece of mechanism. There may be clockwork in the table on which the dial stands, or in the frame; and delicate invisible hands may run behind the glass, so as to give the hands motion; or quicksilver may be cleverly employed in the hour hand, so as to give motion for a certain time.

Pray, can any of your readers give any explanation of this clock, or tell me the names of parties interested in the same?

I am, Sir, yours, &c.,

A Constant Reader.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

SLEIGHT, T. *An improved compound for curing disorders of the bowels, cholera, diarrhœa, and dysentery.* Patent dated August 9, 1855. (No. 1806.)

This invention consists in manufacturing a medicinal compound from the following materials: viz., the apple of the pinus picea, or silver fir-tree, which must be pulverized, and have added to it a certain quantity of the essential oil of cassia, of peppermint, of cloves and of nutmeg, or of their equivalents, dissolved in spirits of wine. To this mixture tincture of opium diluted with water is added, and the compound, thus completed.

HEAVEN, A. *Improvements in machinery for embroidering fabrics.* Patent dated August 10, 1855. (No. 1809.)

This invention consists in piercing, punching, or cutting holes in fabrics, by means of stilettoes and punches applied to the ordinary embroidering machines, or by other means, previous to their being embroidered or sewed round their edges.

MICKLE, W. *Improvements in smelting or producing iron from ore in blast furnaces.* Patent dated August 10, 1855. (No. 1810.)

A description of this invention will shortly be given.

LANCASTER, W. H., and J. SMITH. *Certain improvements in the manufacture of gas for illuminating, heating, and other purposes.* Patent dated August 10, 1855. (No. 1811.)

These improvements consist in introducing into an ordinary gas retort a certain quantity of charcoal along with the coal therein, and in pouring water or admitting steam into the retort during the process of distillation, by which decomposition of the coal and water is effected simultaneously.

Claim.—The manufacture of carburetted hydrogen gas, or its compounds, by the simultaneous decomposition of coal and of water, with or without charcoal, in one vessel or retort.

DURHAM, G., and C. WYATT. *Improvements in the manufacture of grease for lubricating the axles of railway and other carriages, and the journals of machinery generally.* Patent dated August 10, 1855. (No. 1812.)

The inventors take 1 ton of tallow, ½ a ton of soap, and 2 cwt. of resin (or other quantities in like proportions); in cold weather a less quantity of resin, say 1 cwt. will be sufficient. To these ingredients is added warm water in such quantity as to reduce the mixture to a semi-fluid state, or the consistence of flour paste. The tallow and soap may be melted either together or separately, the water is then added, and then the melted resin, the whole being subsequently kept stirred till cool.

FINCH, E. *Improvements in machinery for discharging coals, minerals, and other materials, from railway, tramway, and other waggons.* Patent dated August 10, 1855. (No. 1814.)

A description of this invention is given on page 276 of this number.

FINCH, E. *Improvements in machinery for loading and unloading coal and other vessels.* Patent dated August 10, 1855. (No. 1815.)

This invention consists in employing for the above purpose two vertical levers or beams, which turn on a horizontal axis, and carry between them at one end a pulley, over which the chain passes to the load, and this chain is also connected with any suitable mechanism by which sufficient power is obtained to lift the load and the levers or beams. The latter carry between them at their other ends, and on the other side of the axis, a counterpoise sufficiently heavy to lift the longer arms of the levers or beams, and also to assist in raising the load. On the axis on which the beams turn is fixed a toothed segment into which an endless screw works. Thus, by working this endless screw the load is lifted from the ground, and as the screw continues to work it swings between the two levers or beams, it having been previously raised by the tackle sufficiently to clear the counterpoise; the screw is afterwards worked until the load is over the position into which it is to be lowered, and then the lowering is effected by the tackle. The inventor prefers to arrange the apparatus on a carriage to run on a tramway, and to mount on the same carriage a small steam engine to work the endless screw, &c.

MORIN, A. *Improvements in the manufacture of artificial fuel.* Patent dated August 10, 1855. (No. 1816.)

This invention consists in forming a smokeless fuel from small coal or coke mixed with tar or bitumen. *Claim.*—Distilling off tar and other matters from artificial fuel, by heating the fuel in an iron oven, and collecting the volatilized matters in a suitable condenser in connection therewith; also raising the heat of such iron oven after the distillation has ceased, or nearly so, to char or decompose such bituminous matters as will not distil over, and which would injure the quality of the fuel.

STEVENS, J. L. *Improvements in steam-boilers.* Patent dated August 10, 1855. (No. 1817.)

A description of this invention is given on page 276 of this number. *Claim.*—An arrangement of the parts of steam boilers so as to form combustion or igniting chambers or boxes in front of the boilers, such

chambers being separated by flues or tubes from the furnaces thereof, and supplied with atmospheric air to mix with the products of combustion within those chambers.

LATOUR, P. and M. *An improved machine to be used for cutting nails and driving them into the shoe.* Patent dated August 10, 1855. (No. 1818.)

The inventors describe certain arrangements of machinery by means of which the nail is both made and driven into the shoe.

LAGERGREN, S. *Improvements in paddle-wheels.* Patent dated August 10, 1855. (No. 1819.)

Claims.—1. Constructing paddle-wheels so that the paddles are made to keep vertical positions, or positions perpendicular to the current of the water. 2. Transmitting the same force and speed to two shafts on the same wheel by means of a *cardan* knee, or any other suitable mechanical arrangement.

ULLMER, E. and W. *Improvements in machines for cutting paper, card, and mill-boards, and other like substances.* Patent dated August 10, 1855. (No. 1821.)

A full illustrated description of this invention was given on page 169 of No. 1698.

HEWITT, T. *Improvements in machinery for pulverizing and levigating by means of pestle and mortar.* Patent dated August 11, 1855. (No. 1823.)

This invention consists of certain improved combinations of parts for imparting an eccentric or concentric rotary and rolling motion to the pestles of mortars. The handle of the pestle is supported in a swivel bearing, and the upper end of the handle fits in a slot in a pulley, or is connected to a sliding bush fitting in the said pulley, to which rotary motion is given in any suitable manner.

PRETSCH, P. *Improvements in the application of certain designs obtained on metallic surfaces by photographic and other agency.* Patent dated August 11, 1855. (No. 1824.)

This invention relates to a former one patented by the inventor, November 9, 1854. The inventor employs copper or other suitable plates engraved by the former process, for the formation of cylinders, to be employed in calico and similar printing, embossing, and for other purposes. Or cylinders may be formed directly by the electrotype process, by means of suitable tubular or other arrangements of the patentee's engraved plates to serve as moulds, and the cylinders produced therefrom may be strengthened by the insertion of metal rollers, cast metal, &c.

GARDNER, J. *Improvements in the manufacture of salt.* Patent dated August 11, 1855. (No. 1825.)

The inventor constructs evaporating pans with flat or nearly flat bottoms, and makes the sides project or dip downwards. The upper portion of the pan or pans is used for the brine or saline solution to be evaporated, and the lower or chambered portion is applied only to collect the steam arising from any pan or pans placed underneath, as they are in his arrangement.

REEVES, C. E. *Improvements in the construction of repeating fire-arms.* Patent dated August 11, 1855. (No. 1826.)

These improvements relate,—1. To an improved arrangement of parts for facilitating the charging of fire-arms, so that a repetition of discharges may be effected in quick succession. They are adapted to breech-loading fire-arms; and one of them has for its object the securing of the breech in its place when the charge is inserted. The moveable breech fits into the end of the barrel, and is held in close contact therewith by the lateral pressure of a wedge or stop-piece which is hinged to the barrel and lock-frame, and drops between the rear end of the breech and a false breech. In order to charge the gun, this stop-piece is first raised, and the breech is then slidden back clear of the barrel into the space vacated by the stop-piece, by means of a finger lever, with which the moveable breech is provided at its side. The moveable breech is then turned up sufficiently to admit of the charge being placed therein, and when this has been done, the breech is brought down again into a line with the barrel, and then slidden forward and secured in position by the hinged top-piece, or wedge. 2. The construction of the lock is simplified, by causing the main string to bear, through the intervention of the anti-friction roller, directly on the tumbler to which the hammer is attached, and by providing bearings for the tumbler in the trigger-plate, instead of the lock-plate, which is on the under side of the gun stock.

BROWN, W. *Improvements in the manufacture of sheet metals, casks, and kegs.* Patent dated August 11, 1855. (No. 1827.)

Claim.—The manufacture of casks or keys, each with six equal sides, when using sheet iron, tin plate or other sheet metal, and when made with flanched heads or ends.

TURLETTE, L. *A portable alarm-apparatus, for the prevention of robbery by false keys, &c.* Patent dated August 11, 1855. (No. 1828.)

The inventor describes an improved apparatus for indicating any burglarious attempt to enter doors or windows to which it is applied, by causing it to ring an alarm, and also light a candle, by firing a percussion cap.

MORRISON, A. C. *An improved compound or mixture for feeding horses and other cattle.* Patent dated August 11, 1855. (No. 1829.)

This invention is an improvement upon a former one patented by Mr. G. W. Henri, January 30, 1855, and it consists in combining kidney beans, barley, oats, rice, linseed, liquorice, nitre, carraway, Peruvian bark, galingal, gentian, sulphur, salt, and resin, with peas, cream of tartar, carbonate of soda, grains of paradise, ginger root, Iceland moss, arrowroot, aniseed, cardamums, turmeric, cascarilla bark, calumba root, canella, alba, and guiaiacum.

TOPHAM, E. *Apparatus for cleansing out the sediment from the water in steam boilers, and preventing incrustation of the same.* Patent dated August 11, 1855. (No. 1830.)

This invention is described on page 275 of this number.

NORMANDY, L. *A new circular weaving machine.* (A communication.) Patent dated August 13, 1855. (No. 1831.)

The patentee describes a machine combining—1. A circular and flexible reed. 2. A circular inclined surface, working both as a shuttle-driver and a batten. 3. Certain warp-guiding blades disposed in a circular manner. 4. A shuttle of a curved shape. The principle of circular weaving by means of a shuttle and a flexible beating-reed, is considered by the patentee to be new.

GREGORY, W. J. *Improvements in the construction of camp furniture.* Patent dated August 13, 1855. (No. 1832.)

This invention relates—1. To a novel construction of folding bedstead, which admits of being folded to form a couch or chair, with or without arms, and permits of the addition of a canopy to the head of the bed. 2. To certain means of packing the folding bedstead for transport, and of rendering the chest which receives the bed available for a variety of camp uses.

HANCOCK, W. *Improvements in the manufacture of casks or barrels, or of the linings of the same, and which improvements are also applicable to other hollow vessels.* Patent dated August 13, 1855. (No. 1833.)

These improvements relate—1. To a new mode of manufacturing casks or barrels of gutta percha, or compounds of gutta percha. 2. To a new mode of manufacturing linings of casks or barrels, which are not of themselves air or water tight, and by these means rendering them so.

DRAPER, E. D. and G. *An improved vessel or can for oiling machinery.* (A communication.) Patent dated August 13, 1855. (No. 1835.)

A description of this invention will shortly be given.

BLACKBURN, R., and W. L. DUNCAN. *Improvements in bleaching.* Patent dated August 13, 1855. (No. 1836.)

This invention consists in causing cloths or yarns to be moved in an extended state in the liquors employed in bleaching, in such manner that the several vessels required being contiguous to each other, the cloths or yarns enter the liquor in the first and circulate to and fro several times therein, then pass into the liquor in the next vessel, circulate there, then pass into the third, and so on.

BUTLER, T. *Improvements in locks.* Patent dated August 13, 1855. (No. 1837.)

This invention consists in affixing a number of stumps to the bolt of a lock, which stumps bear against circular pieces of metal revolving on centres connected with the upper plate of the lock; these circular pieces form stops, against which the stumps bear. In the revolving stops are formed grooves through which the stumps pass when the bolt is shot in or out. Thus the bolt cannot be moved until each of the stops is arranged with its groove opposite to the stump which is to pass through it. The stops may be turned by hand from the exterior of the lock; but it is preferred so to arrange them that they can only be turned by a key through holes arranged round the main key-hole on the face of the lock. The front plate of the lock is also arranged with hooks, which catch into the bolt, so that the plate of the lock can only be removed when the bolt is half shot, or in some other given position.

THORNTON, A. and F. *Improvements in the manufacture of elastic or knitted plush or piled fabrics for hats and other purposes.* Patent dated August 13, 1855. (No. 1838.)

This invention has for its object improvements in combining knitting machinery for making tubular knit fabrics, with pile thereon, suitable for the manufacture of hats, &c.

KEMPSON, T. *A new or improved steam engine and boiler.* Patent dated August 14, 1855. (No. 1839.)

The inventor describes a direct-action steam engine in which one high-pressure and one low-pressure cylinder are arranged in the same line, and having a double-acting air-pump also in the same line as the cylinders; also, a steam boiler in which the fire pursues a peculiar course through the flues, and which is set upon metal supports.

SANDERS, G., and R. E. DONOVAN. *Improvements in maintaining the level of the water or other liquids in gas-meters and steam boilers, and regulating or controlling the action of such apparatus.* Patent dated August 14, 1855. (No. 1841.)

The inventors effect their object by means of one or more floats or compensators of peculiar construction, that is to

say, a solid or hollow body capable of revolving on an axis, and so loaded or balanced that it shall sink into the liquid only in proportion as the liquid is withdrawn by evaporation or otherwise, and shall rise above the level of the liquid in proportion as liquid is added, thus maintaining a constant liquid level.

SHEARS, G. *An improved construction of stereoscopes.* Patent dated August 14, 1855. (No. 1842.)

The inventor makes each of the sides of the instrument of two pieces, and connects these together by a butt hinge, so that the sides may be folded up. He also attaches to the inner face of these pieces a vulcanized India-rubber spring, in such manner that when the stereoscope is opened the springs will retain the parts in position.

MELLOR, M. *Certain improvements in self-acting mules.* Patent dated August 14, 1855. (No. 1843).

This invention relates to such mules as Sharp, Roberts, and Co.'s, and consists in placing the winding-on-drum, so that its axis corresponds with that of the horizontal shaft which imparts motion to the vertical drums, and in keying on this axis of the drum or shaft the ratchet-wheel upon which the click or pawl of the winding-on-drum acts, &c.

HADDAN, J. C. *Improvements in the manufacture of cannon.* Patent dated August 14, 1855. (No. 1845.)

This invention consists—1. In lining the interior of old and of new cannon with tubes, formed externally to fit the cannon, and internally with a rifled or other bore, such tubes being either in one, two, or more pieces longitudinally, or transversely, or both, and inserted after the body of the cannon has been cast. In manufacturing or adapting cannon with Y or other fittings, to receive removeable telescopes, or sighting tubes with cross wires, or other arrangements for centreing correctly, so that the telescopes or sighting tubes may be removed immediately before firing. This part of the invention is performed by fixing upon the exterior of the cannon fittings similar to those in use for holding the telescope of the ordinary Y level or theodolite, omitting the straps which fix it down; but these may be used if desired.

STATHAM, S., and W. SMITH. *Improvements in electric telegraph cables or cores for the same.* Patent dated August 15, 1855. (No. 1848.)

Claims.—1. The construction of electric telegraph cables, or cores for cables, by laying one or more wires spirally round a core of insulating material, with or without a wire therein, or of fibrous material, covered with insulating material, prior to such wires receiving their final insulation. 2. The constructing of electric telegraph cables or cores, by adding to a cable or core formed as above, successive alternate layers of wires and insulating material, as described. 3. An improved joint described.

NEWTON, A. V. *Improved machinery for manufacturing railroad chairs.* (A communication.) Patent dated August 15, 1855. (No. 1850.)

This invention consists in arranging and combining with a suitable frame a cam shaft, which, through a rocking lever, depresses a die that holds fast the metal which is to form a railroad chair while being cut by a pair of roller shears, such shears being forced upwards by a second lever operated by the same cam shaft. Also, in combination with the said roller shears two adjustable benders, secured at opposite sides of the machine, and operated by cams on the end of the cam shaft, for the purpose of bending over the lips of the chair, as they are cut and raised by the action of the roller shears, so as to give them the form of the die, from which, when the chair is shaped, it is discharged by the action of a forked rod or plunger.

AVERY, J. *An improved apparatus to be applied to drawers to secure them, and to give notice when any attempt is made to open the same by any improper person.* (A communication.) Patent dated August 15, 1855. (No. 1851.)

This invention consists in making the knob of a drawer moveable, and so combining it with an alarm apparatus, as to cause an alarm to be sounded whenever an attempt to open the drawer, by pulling on the knob, is attempted.

BARBER, J. *Certain improvements in steam engines.* Patent dated August 15, 1855. (No. 1853.)

The inventor describes an arrangement of parts, which cannot be well described without illustrations, and which is designed to increase the effective power of the steam engine by enabling the crank to pass the centre with greater facility than hitherto.

MAY, F. *Improvements in obtaining instantaneous light.* (A communication.) Patent dated August 15, 1855. (No. 1854.)

This invention consists in forming matches with a composition which shall not be liable to ignite when subjected to simple friction, unless the surface used for obtaining the friction be properly prepared with reference to the materials placed on the matches.

FONTAINEMOREAU, P. A. L. DE. *Certain improvements in Jacquard machines.* (A communication.) Patent dated August 16, 1855. (No. 1855.)

This invention consists—1. In the em-

ployment of small iron blades in connection with a metal cylinder or drum pierced with holes to form the design, as a substitute for the cards of ordinary Jacquard looms. 2. In the construction and arrangement of apparatus for piercing thin sheet metal to form the design on the cylinder or drum, &c.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

ADAMS, W. B. *Improvements in locomotive engines and their trains.* Application dated August 9, 1855. (No. 1807.)

This invention consists in raising the driving wheels of locomotive engines to such a height above the rails that they may rest on their peripheries, supported by the peripheries of rolling wheels beneath them, which latter are supported on the rails or road in such manner that each driving wheel will rest on two rolling wheels, and the weight being thus distributed on two wheels will permit of a great amount of adhesive power, without crushing the tyres, or rails, or road; the rolling wheels being all loose or revolving on their axles, it will not be requisite that they should all be of exactly equal diameters; nor will it be necessary to confine the rolling wheels to any particular diameter, for their rolling movement will correspond to the length round the driving tyres; and two pairs of rolling wheels coupled together, with the driving wheels pressing on them, will be a substitute for what is usually called a coupled engine.

ROBERTSON, J. *Improvements in the manufacture of casks and other wooden vessels, and in machinery or apparatus for those purposes.* Application dated August 9, 1855. (No. 1808.)

This invention relates to certain improved modifications of and adaptations to the machine for topping, sloping, hollowing, and grooving casks, for which letters patent, dated 29th July, 1848, were obtained by the patentee, and it consists, first, in the use of metal and other guards fitted on to the back or front side of the cutters, which effect the topping, sloping, and hollowing of the casks and staves, by which means the danger arising from the cutters being brought too quickly against the wood, and consequently digging too deeply therein, is entirely avoided. The second part of the invention relates to an arrangement for adjusting the vertical position of the cask, in the machine for topping, &c., by employing a double table, the upper plate of which is made to rise or fall by means of a screw.

BETTELEY, J. *Improvements in the manufacture of ships' chain cables.* Application dated August 10, 1855. (No. 1818.)

According to this invention ships' chain cables are made of iron of various sectional forms, in place of iron circular in section. They are also made of links in which the sides are bent together sufficiently to prevent the fouling or riding over each other of the two contained links. Or the fouling of the links is prevented by making the links of iron rolled with projections, which, in the finished link stand partially across, and keep the contained links in their proper places. Sometimes these two methods are combined. The use of a stay in the link is by these means avoided, while the fouling is still prevented.

INNES, G. R. *Improvements in raising and lowering rolling blinds.* (A communication.) Application dated August 10, 1855. (No. 1820.)

This invention consists in cutting a longitudinal slot or groove the entire length of the roller on which the blind is to be fixed, and in providing a lath of hard wood or metal to secure the edge of the blind in the groove.

BARAGNON, P. L. P. *A certain apparatus for preserving and reckoning coin.* Application dated August 11, 1855. (No. 1822.)

The construction of a new purse or apparatus for indicating the amount of money or other articles which it contains, to be called "Baragnon's Comte Monnaie, or Self-acting Counter." It consists of a solid cylindrical block of wood, ivory, or other material, which has formed in it circular holes for the coins, in each of which holes is fixed a spiral spring having a disc of metal attached to the top of it and upon which the coin is placed. To the edge of the disc is fixed an indicator which shows by rising and falling beside a graduated scale the amount of money in, or taken out of, the aperture.

HORSFIELD, W. *Improvements in the construction of axle-boxes for railway carriages.* Application dated August 13, 1855. (No. 1834.)

Instead of forming the principal part of the axle-box of several separate pieces of metal the inventor casts it in one piece and of such shape as to dispense with hinges, pins, rivets, or screws or other fittings. The top of the axle-box is likewise peculiarly formed, in order to receive and hold the weight-spring upon which the carriage rests without the use of screws, &c. The cover of the grease-box is also maintained dust-proof by means of a spring, so contrived as to require neither fitting nor fastening to the axle-box.

VENABLES, J. *Improvements in ornamenting articles made of clay and other similar plastic materials.* Application dated August 14, 1855. (No. 1840.)

This invention consists in the production

upon the surfaces of such articles of depressed or undersunk ornaments or patterns, by pressing the surface of each of the articles to be ornamented, whilst in a plastic state, against the face of a mould or die.

MARION, L. *An apparatus for consuming smoke.* Application dated August 14, 1855. (No. 1844.)

This invention consists in admitting air at the bridge of the furnace through a plate on which is formed nozzles, which distribute the air admitted in many directions, and the air thus admitted is heated at the bridge, by using a flame bed of iron, which forms the top of the passage by which the air is led to the bridge. A small quantity of air is also admitted by apertures opening into the body of the furnace before the bridge, and doors are adapted to the passages leading to these apertures, so that the quantity of air admitted can be regulated at will.

COGHLAN, J. *An improved method of pivoting artificial teeth.* Application dated August 15, 1855. (No. 1846.)

This invention consists "in the use of capillary tubes in lieu of the solid wire now used."

POUGET, L. A. *Improvements in moderator lamps.* Application dated August 15, 1855. (No. 1847.)

These improvements consist in establishing in the oil vessel of these lamps a sort of pouch or diaphragm, formed by any suitable flexible and elastic material, and of sufficient strength in order that on being pressed on the surface of the oil this latter is forced up through the ascending tube towards the burner.

NAPIER, G. *Constructing furnaces for marine and other boilers, as well as for other furnaces, together with the apparatus employed therein for the purpose of heating the air previous to entering the furnace or furnaces, and for consuming the smoke and the saving of fuel.* Application dated August 15, 1855. (No. 1849.)

This invention consists "of two or more furnaces with two or more flues to each furnace, one of which flues being for the purpose of conveying the air from the front of the boiler or building or other more convenient part to a retort or receiver comprising two or more separate chambers or compartments, according to the number of furnaces in use, which it is proposed to place in such a situation and so constructed that the air being made to pass through it becomes heated to a high temperature, and then conveyed from behind or otherwise by means of an under flue into the ash-pit (which is closed) passes up between the furnace bars."

JOHNSON, J. H. *Improvements in reins.* (A communication.) Application dated August 15, 1855. (No. 1852.)

These improvements consist in adapting a thin steel rod or bar to each of the straps of the reins, the bar extending from the bit to a considerable distance along the bridle or straps, leaving that portion of the reins forming the two sides perfectly flexible, as in the ordinary reins. The bridle thus constructed will be comparatively rigid in one part, and perfectly flexible in another, thus giving greater control over the animal, as it may be pulled by one rein and pushed by the other.

PROVISIONAL PROTECTIONS.

Dated December 5, 1855.

2735. Thomas Mara Fell, of Frederick-street, Gray's-inn-road, Middlesex, civil engineer. An improved ships' cooking and distilling-apparatus, and improvements for the production of fresh water from sea or salt water.

Dated January 3, 1856.

21. Edward Vansittart Neale, of Russell-place, Fitzroy-square, Middlesex, Esq. Improvements in labels.

Dated January 8, 1856.

57. Claude Louis Pariset, chemist, of Paris, French Empire. An improved paste for manufacturing paper, pasteboard, and other similar products.

59. Carlo Pietroni, of London-wall, London, merchant. Improvements in printing on cloth and other fabrics. A communication from G. Bossi, of Vienna, Austria.

Dated January 21, 1856.

157. John Coope Haddan, of Cannon-row, Westminster, civil engineer. Improvements in omnibuses and other similar carriages.

Dated January 25, 1856.

197. Félix Chauchard, of Paris, France. Improvements in the manufacture of paper and pasteboard from vegetable and wood substances.

203. John Beads, of Pendleton, near Manchester, Lancaster, manager. Improvements in machinery or apparatus for spinning cotton, wool, or other fibrous substances where self-acting mules are used.

Dated February 4, 1856.

295. Alexandre Tolhausen, of Duke-street, Adelphi, Middlesex, Interpreter at the Imperial Court of Paris. Certain improvements in machinery for picking, carding, and combing fibrous substances. A communication from R. Kitson, of Lowell, United States.

Dated February 5, 1856.

314. Alexander McDougall, of Manchester, Lancaster, manufacturing chemist. Improvements in treating bones, other animal matters, and other substances containing phosphates, for the purpose of obtaining manure and other products.

Dated February 7, 1856.

332. William Kenworthy, of Blackburn, Lancaster, manufacturer. Certain improvements in self-acting mules.

Dated February 15, 1856.

391. Edward Oldfield, of the firm of Oddy, Thompson, and Oldfield, of the Adelphi Ironworks, Salford, Lancaster, machine-makers. Certain improvements in self-acting mules for spinning.

393. Edmund Leach, James Leach, and Edmund Leach the younger, of Rochdale, Lancaster, machine-makers. Improvements in machinery or apparatus for preparing, spinning, and drying yarns, and manufacturing the same into cloth.

395. Ebenezer Dobell, of Hastings, Sussex, jeweller. Improvements in lamp-glasses or conductors of light.

397. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in fountain pens. A communication from N. A. Prince, of New York, United States.

Dated February 16, 1856.

399. André Prosper Rochette, of Brighouse, near Huddersfield. Improvements in treating soap-suds to obtain products therefrom.

401. Frederick Parker, of the Halve, Trowbridge, Wilts, engineer. Improved apparatus for affording exercise to the human body.

403. Hyam Jacob Hyams, of Stanhope-street, Hampstead-road, Middlesex, gas-meter maker. Improvements in the construction of gas-meters.

Dated February 18, 1856.

404. William Willcocks Sleigh, of London, physician and surgeon. Producing motive power, which he entitles "The Hydrostatic Motive-power Engine."

405. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in the construction of steam engines for the purpose of converting the reciprocating motion into a rotary motion, and for operating the slide-valves. A communication.

407. Henry Hodgkinson, of Donegall-street-place, Belfast, Antrim. Improved machinery or apparatus for bleaching cotton, linen, and other woven or textile fabrics.

409. Moss Defries, of the firm of Jonas Defries and Sons, of Houndsditch. An improvement in supplying oil to the burners of lamps.

Dated February 19, 1856.

411. William Henry Walenn, of Chancery-lane, London, Middlesex. Improvements in saw-teeth. A communication from N. Barlow, of Newark, United States.

413. Sylvester Emil Siebel, of Bradfork, York, merchant. Certain improvements in apparatus for weaving ribbed cloth and bands of chenille. A communication.

415. William Henry Bowers, of Singleton-street South, East-road, Middlesex. Improvements in the construction of railways.

417. John Gedge, of Wellington-street South, Middlesex. Improvements in curry-combs. A communication from F. B. Loubatieres, of Agen, France.

419. Charles Scott Jackson, of Cannon-street, London, Lieut. R. N An improvement in preserving and disinfecting timber and other substances.

421. William Savory, of Gloucester, engineer, and Henry Arkell, of the same place, builder. Improvements in apparatus for the passage of water and other fluids.

Dated February 20, 1856.

425. Thomas Smith and Joseph Gill, of Hebden-bridge, York, manufacturers. Improvements in the mode or method of casing horizontal shafting.

427. James Knowles, of Eagley-bank, near Bolton le-Moors, Lancaster, coal proprietor. Improvements in the construction of metallic pistons.

429. John Gedge, of Wellington-street South, Middlesex. Improvements in syphons. A communication from B. A. S. Duvignau, France.

431. John Freer, of Rothley, Leicester, agricultural implement maker. Improvements in machines for planting grain and seed, and an improved seed feeder and meter for planting machines.

433. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in steam-engines. A communication from N. Duvoir, of Liancourt, France, mechanician.

435. Jeremiah Clark, of Moorgate-street, London, stationer, and James Austin, of the same place, stationer's assistant. Improvements in apparatus for stoppering or closing bottles, jars, and other similar vessels.

437. Henry Sherwood, of Esholt, near Leeds, York, woollen, and worsted manufacturer. Improved means of treating the "spun waste" of wool, cotton, silk, flax, hemp, and other fibrous substances so as to render it suitable for re-working.

438. John Barsham, of Kingston-upon-Thames, Surrey, manufacturer. Improvements in the manufacture of cases or packings for bottles and jars.

439. William Oliver Johnston, of Broom-hill Colliery, Acklington, Northumberland, engineer, and John Dixon, of High Bridge Works, Newcastle-upon-Tyne, engineer. Improvements in cutting and working coal.

Dated February 21, 1856.

441. Louis Auguste Joyeux, of Marseilles, France. Improvements in obtaining motive power.

443. William Dawson, of Otley, York, machine maker. Improvements in machinery or apparatus for cutting paper or other materials.

445. John Gedge of Wellington-street South, Middlesex. Improvements in looms. A communication from J. Desage, of Rheims, France.

449. Thomas Turner Chatwin, of Birmingham, Warwick, manufacturer, and John Frederick Chatwin, of Birmingham, manufacturer. Improvements in buttons.

450. James Diment, of Bristol, plasterer. Improvements in the manufacture of cements.

451. Charles Frederick Dennet, of Lansdowne-villas, Kensington-park, Middlesex, gentleman, and George Pays, of Oxford-street, in the same county, army-contractor. Improvements in cartouche and percussion cap pouches.

Dated February 22, 1856.

453. Frederick William Mowbray, of Saltaire, near Bradford, York, gentleman. Improvements in machinery or apparatus employed in spinning and doubling.

455. William Vincent Wallace, of Great Portland-street, Middlesex, and Benjamin Lawrence Sowell, of Harrow-road, in the same county, gentleman. Improvements in treating tobacco in order to manufacture cigars and other articles for smoking, together with the manufacture of cigars and cheroots from the tobacco so treated. A communication.

457. Leonard Bower, of Birmingham, Warwick, manufacturer. New or improved machinery for the manufacture of screws.

459. Georges Toucas, of Rue de l'Echiquier, Paris, France, metallurgist. A new metallic alloy.

Dated February 23, 1856.

463. David Jones, of Green-hill Villa, Ragland, Monmouth, civil engineer. Certain improvements in obtaining and applying motive power.

465. Samuel Walsh and John Henry Brierley, smallware manufacturers, of Stannary Works, Halifax, and Noble-street, Cheapside, London. Colouring and graining skins of leather on one side, and japanning them on the other side.

467. Robert Baker Jones, of Limerick, gentleman. Improvements in cooking apparatus.

469. James Warburton, of Addingham, Otley, York. Improvements in machinery for combing wool, cotton, and other fibres.

471. William Sangster, of Cheapside, Middlesex. An improvement in the manufacture of umbrellas and parasols.

473. Charles Brook the younger, of Meltham-mills, near Huddersfield, York, cotton spinner, and Joseph Hirst, of Wilshaw, near Huddersfield, woollen cloth manufacturer. An improvement in finishing yarns of wool or hair, and in the finishing of woven fabrics or piece goods.

Dated February 28, 1856.

506. Francis Prime Walker, of Manchester, Lancaster, ironmonger. Improvements in machinery for cutting hay, straw, and other vegetable substances.

508. John Smith, of Derby, brass founder. Improvements in water-gauges for steam boilers, which improvements are also applicable to cocks used for steam and other purposes.

510. Philip Davies Margesson, of Woolwich. Improvements in the manufacture of iron from iron ores.

512. John Fowler, junior, of Havering, near Romford, Essex, engineer, and David Greig, of Barkingside, Essex, farmer. Improvements in ploughing and tilling land.

514. Charles Alexandre de Fonbonne, of Paris. Improved apparatus for the manufacture of coke and for blasting, also for the production and extraction of illuminating and combustible gas, as well as ammoniacal and bituminous matters, part of such apparatus being applicable to the consumption of smoke.

516. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in treating bituminous shale, boghead, mineral, and other like schistous bodies, in order to obtain various commercial products therefrom. A communication from P. G. Barry.

Dated February 29, 1856.

518. John Brierley, of Blackburn, Lancaster, spinner and manufacturer. Improvements in machinery or apparatus for twisting and doubling yarns for mule-banding and similar purposes.

520. John Graham, of Aughton, Lancaster, of the firm of Kay and Hilton, Liverpool, millstone manufacturer. Improved machinery for cleaning and dressing rice and other grain.

522. Foster Connor, of Belfast, Antrim, Ireland, linen manufacturer. Improvements in looms for weaving.

524. William Allen Turner, of Wood-street, Cheapside, London, India-rubber manufacturer. Improvements in the manufacture of elastic tubing.

Dated March 1, 1856.

526. William Clark, of Upper-terrace, Islington, Middlesex, engineer. Improvements in cutting or shaping trousers.

528. John Reading, of Birmingham, Warwick, manufacturer. New or improved fastenings for attaching watch-keys, seals, watches, lockets, articles of jewellery, and ornamental articles of dress in general to chains, and for securing the catches of brooches.

530. John Henry Johnson, of Lincoln's-in-fields, Middlesex, gentleman. Improvements in looms for weaving. A communication from G. Bornèque, of Bavillers, France, manufacturer.

532. Louis Uytborck, of Montagne-de-la-Cour, Brussels, Belgium. An improvement in locomotive and other tubular boilers, in which steam is generated.

534. Ferdinand Kaselowsky, of Bielfield, Prussia. Improvements in winding yarns and thread of flax and hemp in spinning and twisting machines.

536. William Chapman, chemist, and John Henry Teager, engineer, of Ipswich, Suffolk. Improvements in apparatus for cooking animal and vegetable substances, and for heating steam closets.

Dated March 3, 1856.

538. Robert Maynard, engineer, of Whittlesford, Cambridge. Improvements in machinery for cutting and separating agricultural produce.

540. James Wallace, junior, of Glasgow, Lanark, manufacturer. Improvements in bleaching, washing, cleansing, and drying textile fabrics and materials.

542. John Aspinall, of Limehouse, Middlesex, civil engineer. Improvements in machinery for curing sugar, or extracting moisture therefrom, applicable to separating liquids from solids.

544. John Venables, of Burslem, Stafford, china and earthenware manufacturer. Improvements in ornamenting articles made of clay and other similar plastic materials.

Dated March 4, 1856.

546. Edward Poitiers, of Malden-terrace, Haverstock-hill, Middlesex, gentleman. The application of a new material or materials for the manufacture of brushes and for other purposes, and for improvements in the manufacture of street scavengers' and similar brooms or brushes.

548. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improved fabric suitable for ladies' garments. A communication from M. Constant, of Paris.

552. James Platt, of Oldham, Lancaster, mechanical engineer. Improvements in machinery for spinning, doubling, and winding cotton and other fibrous materials. A communication.

Dated March 5, 1856.

554. Samuel Clegg and John Kay, of Padiham, near Burnley, Lancaster, warpers. Improvements in machinery or apparatus for warping yarns.

556. William Billington, of Great George-street, Westminster, civil engineer. An improved method of treating wooden railway sleepers.

558. Charles Morgan, of Cwm Aman, near Llanelly, Carmarthen, gentleman, and Charles Ranken Vickerman, of Kilgetty, near Saundersfoot, Pembroke, gentleman. An improved preparation of fuel, and the application of the same to steam boiler purposes.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," March* 18*th*, 1856.)

2461. Thomas Robert Cooper. Obtaining motion with power and velocity by purely mechanical means.

2474. John Hicks. An improved gauge valve, applicable to boilers of steam engines and to other purposes.

2478. Henry Clinton Page. An improved method of indurating marble and stone, and of permanently fixing colours therein when colouring matters are applied thereto for producing a variegated pattern or device on the surface thereof.

2496. George Cotsell. An improved gutter and kerb for roads and streets.

2499. Joseph Haley. Improvements in the buffers and spring draw bars of wagons or other railway vehicles, and in the application of the same.

2500. Frederick Scholefield. Improvements in machinery or apparatus for cutting paper, card-board, and similar materials.

2503. William Davis. Improvements in the construction and arrangement of furnaces and furnace-bars for the better combustion of smoke and prevention of loss of heat by radiation.

2515. Thomas Burgin. An improved construction of ledger band rest.

2521. John Raywood. An improved rolling, dibbling, sowing, and harrowing machine for wheat and other agricultural produce.

2523. Henry Fletcher. Improvements in the manufacture of nuts, bolts, and other similar articles, and in machinery or apparatus for making the same.

2536. Jules César Alexandre Bouillotte. An improved letter copying-press.

2540. George Cooke. Improvements in flyers used in roving and slubbing frames.

2553. John Wilkinson the elder, and John Wilkinson the younger. Improvements in communicating a shape or configuration to felted cloths and other manufactured fabrics.

2557. Robert Murdoch. Improvements in agricultural apparatus for sowing seeds and depositing manure.

2567. Charles Goodyear. Improvements in shoes and boots when India-rubber is used.

2602. William Smith. Improvements in gas regulators. A communication.

2612. Alfred Vincent Newton. Improved apparatus for dressing flour. A communication.

2620. Oliver Maggs. Improvements in machinery for thrashing and winnowing wheat and other grain.

2622. Coleman Defries. Improvements in the roof lamps for railway carriages.

2643. John Henry Hutchinson. Improved machinery for converting rectilinear motion into rotary motion.

2660. Thomas Greewood. An improvement in the construction of carding engines.

2679. John Henry Johnson. Improvements in the manufacture or preparation of India-rubber and gutta percha, and in the application thereof. A communication.

2694. William Irlam. Improvements in crossings for railways.

2760. Henry Hart. A ship leakage indicator. A communication.

155. Charles Robertson. Improvements in mariners' compasses.

203. John Beads. Improvements in machinery or apparatus for spinning cotton, wool, or other fibrous substances, where self-acting mules are used.

259. James Mash. Improvements in working the valves of steam engines.

261. Henry Tylor. An improved joint, applicable to cots, bedsteads, and other frames in metal.

325. Thomas Frederick Tyerman. Improvements in apparatus to be applied to omnibuses and other carriages for receiving wet umbrellas.

333. Richard Archibald Brooman. A method of obtaining alcohol from the fruit or pod of the carob-tree. A communication.

358. George Tomlinson Bousfield. An improvement in treating fats and oils. A communication.

359. Richard Archibald Brooman. Improvements in the manufacture of cast steel. A communication.

385. Edmund Morewood and George Rogers. Improvements in drying and coating iron and copper.

386. William Watson Hewitson. An improvement in casting the bearings or brasses of machinery.

393. Edmund Leach, James Leach, and Edmund Leach the younger. Improvements in machinery or apparatus for preparing, spinning, and drying yarns, and manufacturing the same into cloth.

403. Hyam Jacob Hyams. Improvements in the construction of gas meters.

404. William Willcocks Sleigh. Producing motive power, which he entitles "The Hydrostatic Motive Power Engine."

405. Alfred Vincent Newton. Improvements in the construction of steam engines for the purpose of converting the reciprocating motion into a rotary motion, and for operating the slide valves. A communication.

415. William Henry Bowers. Improvements in the construction of railways.

419. Charles Scott Jackson. An improvement in preserving and disinfecting timber and other substances.

450. James Diment. Improvements in the manufacture of cements.

453. Frederick William Mowbray. Improvements in machinery or apparatus employed in spinning and doubling.

460. Edward Schischkar. Improvements in cleansing silk, hair, wool, yarn, and textile fabrics.

494. Richard Archibald Brooman. A composition or compositions to be used as a substitute for hops in brewing. A communication.

496. Isaac Reckitt, George Reckitt, and Francis Reckitt. Improvements in the manufacture of starch, British gum, and size.

502. William Exall. Improvements in the manufacture and arrangement of sawing machinery.

508. John Smith. Improvements in water guages for steam boilers, which improvements are also applicable to cocks used for steam and other purposes.

516. Richard Archibald Brooman. Improvements in treating bituminous shale, boghead, mineral, and other like schistous bodies, in order to obtain various commercial products therefrom. A communication.

540. James Wallace, junior. Improvements in bleaching, washing, cleansing, and drying textile fabrics and materials.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

630. Robert Christopher Witty.
645. François Durand.
652. William Malins.
659. William Blinkhorn.
660. George Johnson.
665. Paul Cameron.
669. Richard Archibald Brooman.
670. Auguste Edouard Loradoux Bellford.
672. George Roch Lucas.
696. John Stather.
711. Antoine François Jean Claudet.
718. William Keates.
793. William Edward Newton.
874. Henry William Harman.
2449. Thomas Stainton.

LIST OF SEALED PATENTS.

Sealed 14th March, 1856.

2081. Paul Frederick Wohlgemuth.
2095. Edward Gibbs.
2108. Feridoon Hankey Smith.
2115. William Rothwell Lomax.

2152. Peter Armand Lecomte de Fontainemoreau.
2155. François Xavier Poignand.
2190. George Curling Hope.
2232. François Charles Lepage.
2283. William Lyall.
2309. William Cotton.
2374. Alfred Vincent Newton.
2375. James Smith.
2396. Joseph Charles Frederick Baron de Kleinsorgen.
2572. Alfred Vincent Newton.
2639. Charles May and Paul Prince.
2837. Agnes Wallace and John Wallace.
2921. Frank Clarke Hills.
2929. Nicholas Douglass.
2931. James Edgar Cook.
11. George Hamilton.
31. Charles Hart.
36. Edward Hammond Bentall.
148. Alfred Dawson.

Sealed 18*th*, *March*, 1856.

2112. Louis Cornides.
2121. Asa Lees.
2125. William Pollitt and James Eastwood.
2127. David Chalmers.
2140. Charles Frederick Whitworth.
2146. John Norbury.
2163. Richard Locke Johnson.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

The publication of the communications of "J C." and "J. Truran" on "Mechanical Locomotion" is unavoidably deferred. The same remark applies to several articles of importance already in type.

D. Chattaway.—As we this week publish a day earlier than usual, your letter reached us too late for insertion in this number.

CONTENTS OF THIS NUMBER.

Metford's Improved Theodolite—(*with engravings*) ... 265
Tatlock and Hostage's Railway Chairs—(*with engravings*) ... 270
The Causes of Explosions of Steam Boilers ... 271
Hall's Safety-apparatus for Steam Boilers—(*with engravings*) ... 273
On the Thermal Effects of Fluids in Motion ... 275
Topham's Apparatus for Preventing Steam-boiler Incrustations ... 275
Finch's Improvements in Discharging Materials from Waggons ... 276
Stevens' Improved Boilers ... 276
An improved Cheap Oil-lamp—(*with an engraving*) ... 276
The Smoke Question ... 277
Hydraulic Inquiry ... 277
Mechanical Locomotion ... 278
The Glass Dial-clock ... 278

Specifications of Patents recently Filed:

Sleight	Medicine	279
Heaven	Embroidery	279
Mickle	Smelting Iron	279
Lancaster & Smith	Gas	279
Durham & Wyatt	Lubricating Axles	279
Finch	Coal Waggons	279
Finch	Loading Vessels	279
Morin	Artificial Fuel	279
Stevens	Steam Boilers	279
Latour & Latour	Shoe-nails	280
Lagergren	Paddle-wheels	280
Ullmer & Ullmer	Cutting Paper	280
Hewitt	Pestles and Mortars	280
Pretsch	Designs on Metal	280
Gardner	Salt	280
Reeves	Repeating fire-arms	280
Brown	Metal Casks	280
Turlette	Alarum	280
Morrison	Food for Cattle	280
Topham	Steam Boiler Incrustations	281
Normandy	Circular Loom	281
Gregory	Camp Furniture	281
Hancock	Casks	281
Draper & Draper	Oil-can	281
Blackburn & Duncan	Bleaching	281
Butler	Locks	281
Thornton & Thornton	Elastic Plush	281
Kempson	Engine and Boiler	281
Sanders & Donovan	Feeding Boilers	281
Shears	Stereoscopes	282
Mellor	Self-acting Mules	282
Haddan	Cannon	282
Statham & Smith	Electric Cables	282
Newton	Railroad Chairs	282
Avery	Securing Drawers	282
Barber	Steam Engines	282
May	Lucifers	282
Fontainemoreau	Jacquard Machines	282

Provisional Specifications not Proceeded with:

Adams	Railway Carriages	283
Robertson	Casks	283
Betteley	Ships' Cables	283
Innes	Raising Blinds	283
Baragnon	Purses	283
Horsfield	Railway Axle-boxes	283
Venables	Plastic Articles	283
Marion	Consuming Smoke	284
Coghlan	Artificial Teeth	284
Pouget	Moderator Lamp	284
Napier	Furnaces	284
Johnson	Reins	284

Provisional Protections ... 284
Notices of Intention to Proceed ... 286
Patents on which the Third Year's Stamp-Duty has been Paid ... 287
List of Sealed Patents ... 287
Notices to Correspondents ... 288

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1703.] SATURDAY, MARCH 29, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

STANLEY'S IMPROVEMENTS IN WEIGHING MACHINES.

Fig. 2.

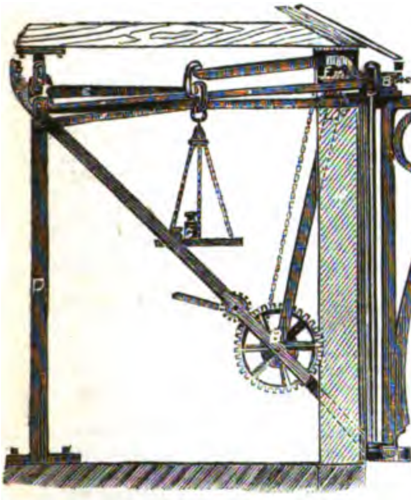


Fig. 3.

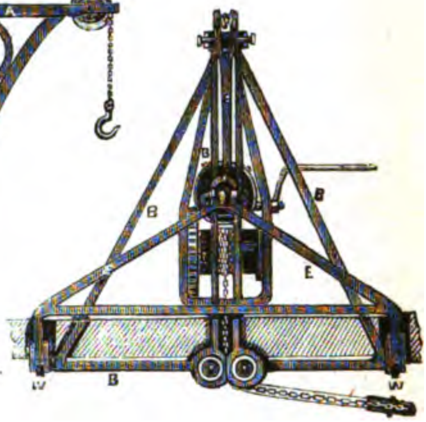
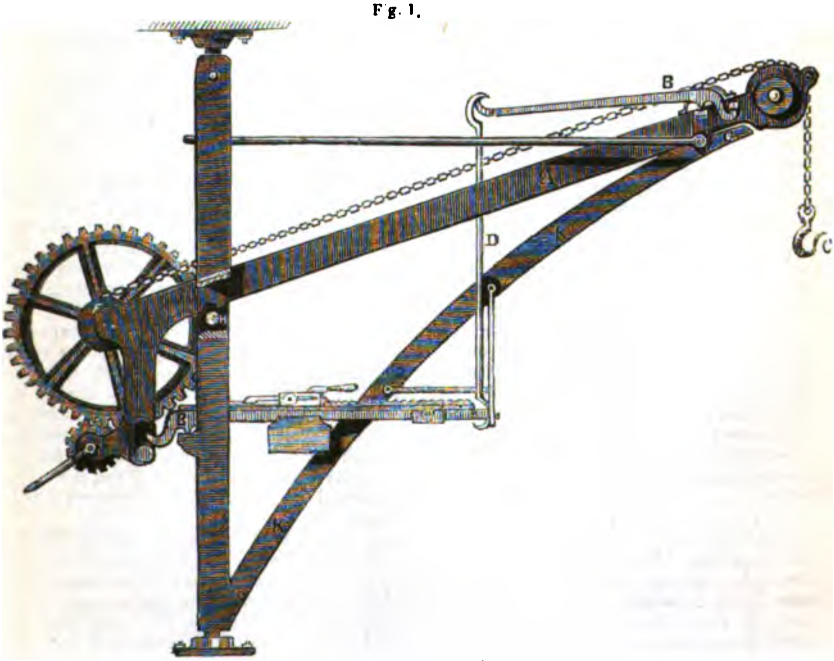


Fig. 1.



STANLEY'S IMPROVEMENTS IN WEIGHING MACHINES.

Mr. J. Stanley, of Whitechapel-road, London, has recently obtained a patent, dated August 2, 1855, for a number of improvements in weighing machines, and weights used with same. His improvements apply principally to weigh-bridges, weighing-cranes, and the class of weighing machines which act upon levers, steelyards, &c.

The first improvement provides that the goods platforms of weighing machines, be carried by novel jointed suspension pieces, so that they may swing freely in any way without wearing the steel arris bearings from which they are suspended, or disturbing any other part of the machine. This is accomplished by the use of hooks, connecting two bearings of action, having a joint, which allows the concave surface to adjust itself to the arris upon which it acts. The novelty consists in the bearings being jointed in such manner that they keep in action in perfect contact, and allow the parts they are connected with to swing freely while this contact of bearing is still preserved.

The second improvement consists in constructing the bearings of action, fulcrums, &c. of any weighing machines, in vessels capable of holding fluid, as oil, mercury, &c., to protect and cover the acting surfaces and edges from oxidation.

The third improvement provides that the ratio of leverage of weighing machines be so arranged that they require all weights used with them to be of some standard of weight. As more ratios of leverage than one are required, they are by this invention divided into five classes, such classification having reference to the ratios of leverage and the required weight of the weights to be used.

The fourth improvement provides that the leverage of steelyards, and such weighing machines as indicate weight by means of steelyards, be arranged to require the moveable poises of some standard of weight, and the divisions thereon, graduated to that of standard measure. It also provides that the graduated scales bear an impression descriptive of the standard of measure as compared with the weight to which they are graduated, and the required weight of moveable poise to act therewith.

The fifth improvement applies to detached weights generally, but particularly to such as are required to be used with weighing machines under the third and fourth improvements; and provides that they be made smooth, galvanized, or otherwise coated, having in each weight a hole or cavity, into which a plug is fixed, for the purpose of adjusting, which plug is made even with the surface of the weight, and stamped or otherwise inscribed with its standard weight, and the class of machine for which it is intended, and the weight it represents upon such machine; such impression to cover the plug. It also provides that the steelyard poises be impressed or inscribed with their standard weight.

The sixth improvement supplies a novel feature in the arrangement and construction of weight scales upon the long arm of steelyards, which arrangement consists in placing the weight scale above the horizontal plane of the axes of action, and staying the same. This principle is also claimed for its application to weight scales under the horizontal line, the for its application to equal balance scales.

The seventh improvement supplies a novel mode of relieving or striking weighing machines, which consists in the application of fluid pressure through the medium of modifications of the hydraulic press. One mode of operation shown is to pump fluid into the cylinder until the piston is forced near to the top of the cylinder, when certain levers move, and the goods platform is lifted from the rests; the machine is then ready for weighing. The platform can be let down again to its rests by letting the fluid out from under the piston by means of a cock or valve for that purpose.

The eighth improvement supplies a novel self-acting and indicating equipoise, composed of a parallel rod or bar of glass or other suitable material, suspended by one of its ends from a balance beam or lever, and the other end immersed in mercury or other suitable fluid, contained in a vessel (the inside of which is but little larger than to allow the rod or bar to pass down), and poised so as the bottom end of the rod or bar finds its equilibrium at or near the bottom of the vessel, having a graduated scale annexed to show the quantity of weight brought to bear on the opposite end of such beam, balance, or lever by the fall of the top surface of the fluid upon the scale; the novelty being, that the bar or rod is nearly of the same external diameter as the vessel is of internal diameter, thereby causing a much greater rise or fall in the fluid than in the bar or rod.

The ninth improvement applies to wharf cranes, and all such cranes as combine lifting with weighing. By this improvement, which, with others that follow, is illustrated by the accompanying engravings, "the jib," says the inventor, "is constructed in two parts, the part K, fig. 1, being fixed firmly to the movable stock, somewhat in the manner of a common crane, from which is supported and balanced by the levers, B, B, the part, A, which is carried at each end by the said levers, and which contains the gear-work and its

connections. The levers are connected by the rod, D, and weight of articles suspended from the hook, C, is taken by steelyard or any other known means from the said levers. At H and G are shown stops or rests, upon which the part, A, is rested when not used in weighing, and which relieves the weighing bearings when not in use. The novelty consists in the part, A, being lifted at or near its two ends, and being made to rest upon the rests, as described. This improvement also applies to cranes fixed to the front of warehouses, with their jibs to move upon vertical axes outside the building, with the winch gearing inside; for which it supplies a framework or carriage, part of which is placed inside the building (to which it is attached), passed through the wall, and is attached to another part outside, which framework or carriage supports the whole crane, and is suspended at or near its extremities, W, W, figs. 2 and 3, which are made to bear upon a series of levers, E, E, which levers are arranged so as to render weight equally to the equipoise, G, whichever position the jib, A, may be turned, and at whatever height the articles are to be lifted. One of the levers is shown with a double fulcrum, Y, supported by the post, D, and arranged to be double-acting, the object of it being to prevent weight on the jib tipping that part up, but will not in all cases be required. It is also applicable to ordinary steelyards, of which it will bring their axes in one plane." The novelty of this part of the invention is that of placing the whole crane upon a carriage similar to that shown, and lifting and weighing the same, by means of suspensions at or near its extremities, and the double fulcrum lever.

NOTÆ MATHEMATICÆ.

BY T. T. WILKINSON, F.R.A.S., &c., &c.

(*Continued from page* 30.)

NO. X.

THE name of Mr. Jonathan Marsland Mabbott has long been familiar to those who have examined the contents of our mathematical periodicals. During the latter half of the last century, he was a frequent contributor to the *Diaries*, the *Lady's and Gentleman's Scientific Receptacle*, &c.; and in the *Manchester Journal* for 1776, and other similar works, we occasionally find his name amongst the general and poetical contributors. At what period he died we have not been able to ascertain; but some of his latest contributions to the mathematics may be found in the *Manchester Memoirs* and in the *Leeds Correspondent* for 1815. Since his death, most of his books and manuscripts have been disposed of by his son; several of the scarcer of the mathematical periodicals were purchased by myself, and my friend Mr. Henry Buckly, of Wood House, Delph, near Manchester, has been fortunate enough to secure two or three of his rough manuscripts, and several original letters to Mr. Mabbott from Wildbore, Dalton, and other distinguished mathematicians. The contents of these volumes, however, do not possess much that is valuable at the present day; yet they seem to deserve a passing notice, as the relics of a distinguished analyst of the old school. In the volume now before us we find a considerable number of solutions to questions which have appeared in the *Diaries* and other works, commencing with a solution to Question 319 in the *Gentleman's Diary* for 1769, and ending with the solution of Question 126 in the *Quarterly Visitor*, proposed by the late Mr. Watson, of Beverley. Many of the solutions are very neatly got up, and very fully portray the analytical tastes of their author. Fluxional and other equations appear to have been especial favourites with him throughout the whole of his career, and whenever he attacks a *geometrical* question, he almost always has recourse to algebraical notation. He published a curious paper, "On Series by Stirling's Methods," in the first volume of the old series of Leybourn's *Mathematical Repository*, and the present collection contains another, on the same subject, mostly selected from Lorgna and the periodicals. In pages 53—55 of the MS. we find a letter from Mr. Thomas Molineux, author of a "Treatise on Arithmetic," in two volumes, requesting Mr. Mabbott to furnish him with a solution to the problem of "drawing two lines from two given points, to intersect in the circumference of a given circle, so that their sum shall be the least possible." The letter is dated "Macclesfield, March 29, 1799," and was replied to from "Manchester, April 21, 1799," when Mr. Mabbott had solved the question algebraically, and had deduced the conclusion that "if with the given points a, b, as foci, an ellipse be described to *touch* the circle, the point of contact will be that required." Neither the proposer nor the solver seem to be aware that their problem had been enunciated by Alhazen, in his "Optics," and had been solved algebraically by Huyghens,

Slusius, and Catalan, in the *Philosophical Transactions* (Dr. Hutton's "Abridgment," vol. viii.), and also by Dr. Simson, at the end of his *Conic Sections*. Both Huyghens and Slusius show that the intersection of ellipses or hyperbolæ, with the given circle, will always furnish the constructions required; but Dr. Simson's *geometrical* analysis, construction, and demonstration, by means of an equilateral hyperbola, are characterised by his usual elegance, and are well worthy of the student's attention. His solution is prefaced by references to others, who had considered the problem previously to the appearance of his own. In pages 68—78 we find the transcript of a letter to the editors of the *Monthly Mirror*, respecting the value of

$$\frac{dy}{dx} = \frac{6x^6}{x^6 - x^4 + 2x^3 + 5x^2 - 6x + 6},$$

when $x = 10$. The question was proposed as the prize in the first number of the new series of the *Mathematical Repository*, by the Rev. John Hellins, B.D., F.R.S., under the signature "Philalethes Cantabrigiensis;" but its solution not appearing sufficiently plain, Mr. Mabbott was induced to forward his own investigation to the *Mirror*. He here adopts the now well-known methods of decomposing rational fractions; but the prolixity of the whole process may be judged of from the number of closely-written quarto pages it occupies in manuscript. Whether this solution was printed in the periodical, or otherwise, I have not been able to ascertain, since this is one of the English serials I have not yet had the good fortune to procure.

Pages 90 to 112 contain the paper on series previously alluded to. It contains forty-three paragraphs, and contains the summation, by various methods, of the following examples. Put Σ for the symbol of summation, then:—

1. $$\Sigma\ \frac{1}{5\cdot12} + \frac{1}{10\cdot15} + \frac{1}{15\cdot18} + \text{\&c., } ad\ inf. = \frac{11}{270}.$$

2. $$\Sigma\ \frac{1}{1\cdot2\cdot4} + \frac{1}{2\cdot3\cdot5} + \frac{1}{3\cdot4\cdot6} + \text{\&c., } ad\ inf. = \frac{7}{2\cdot18}.$$

3. $$\Sigma\ \frac{1}{1\cdot2\cdot3} + \frac{1}{2\cdot3\cdot4} + \frac{1}{3\cdot4\cdot5} + \text{\&c., } ad\ inf. = \frac{1}{4}.$$

4. $$\Sigma\ \frac{1}{2\cdot6\cdot10} - \frac{1}{4\cdot8\cdot12} + \frac{1}{6\cdot10\cdot14} - \text{\&c., } ad\ inf. = \frac{5}{7\cdot6\cdot8}.$$

5. $$\Sigma\ \frac{1}{1\cdot9\cdot10} - \frac{1}{2\cdot12\cdot12} + \frac{1}{3\cdot15\cdot14} - \text{\&c., } ad\ inf. = \frac{5}{24\cdot24}.$$

6. $$\Sigma\ \frac{1}{2\cdot6\cdot8} + \frac{1}{3\cdot8\cdot10} + \frac{1}{4.10\cdot12} + \text{\&c., } ad\ inf. = \frac{1}{48}.$$

7. $$\Sigma\ \frac{1}{1\cdot2\cdot3\cdot4} + \frac{1}{2\cdot3\cdot4\cdot5} + \frac{1}{3\cdot4\cdot5\cdot6} + \text{\&c., } ad\ inf. = \frac{1}{18}.$$

8. $$\Sigma\ \frac{1}{2\cdot4\cdot5\cdot6} + \frac{1}{3\cdot5\cdot6\cdot7} + \frac{1}{4\cdot6\cdot7\cdot8} + \text{\&c., } ad\ inf. = \frac{11}{1440}.$$

9. $$\Sigma\ \frac{2}{1\cdot3\cdot3} + \frac{3}{3\cdot5\cdot9} + \frac{4}{5\cdot7\cdot27} + \text{\&c., } ad\ inf. = \frac{1}{4}.$$

10. $$\Sigma\ \frac{5}{1\cdot2\cdot3} + \frac{6}{2\cdot3\cdot4} + \frac{7}{3\cdot4\cdot5} + \text{\&c., } ad\ inf. = \frac{3}{2}.$$

11. $$\Sigma\ \frac{3\cdot8}{3\cdot6\cdot12\cdot15} + \frac{5\cdot13}{6\cdot8\cdot15\cdot18} + \frac{7\cdot18}{9\cdot10\cdot18\cdot21} + \text{\&c., } ad\ inf. = \frac{211}{5184}.$$

12. $$\Sigma\ \frac{2\cdot5}{1\cdot6\cdot15\cdot21} - \frac{3\cdot8}{2\cdot8\cdot18\cdot24} + \frac{4\cdot11}{3\cdot10\cdot21\cdot27} - \text{\&c., } ad\ inf. = \frac{17}{5184}.$$

13. $$\Sigma\ \frac{1}{3\cdot6\cdot28} + \frac{4}{6\cdot8\cdot35} + \frac{7}{9\cdot10\cdot42} + \text{\&c., } ad\ inf. = \frac{13}{756}.$$

14. $$\Sigma\ 2 + 5 + 8 + \text{\&c. to 100 terms} = 15050.$$

15. $\Sigma\ \frac{1}{1\cdot4} + \frac{1}{2\cdot5} + \frac{1}{3\cdot6} + \&c.,\ ad\ inf. = \frac{11}{18}.$

18. $\Sigma\ \frac{1}{3\cdot5\cdot7} + \frac{2}{4\cdot6\cdot8} + \frac{3}{5\cdot7\cdot9} + \&c.,\ ad\ inf. = \frac{31}{240}.$

23. $\Sigma\ \frac{1}{9\cdot11\cdot12\cdot28} - \frac{1}{10\cdot12\cdot13\cdot40} + \frac{1}{11\cdot13\cdot16\cdot32} - \&c.,\ ad\ inf.$

$$= \frac{631}{34594560}.\ \&c.,\ \&c.$$

The remaining examples are selected from the writings of Clarke, Lorgna, De Moivre, Stirling, *Burrow's Diary*, the *Repository*, &c., but the preceding will serve to give a full idea of the contents of the essay. In a subsequent page he gives the solution to a question from the *Carlisle Journal*, and remarks at the close that it had been solved "by Master Sibsey, a pupil of Joseph Saul, master of Green-row Academy. This Joseph Saul was nephew of the late Mr. Joseph Saul, formerly at Wigan." Mr. Saul, senior, was at one time master of the Grammar School, at Rochdale, and published an Arithmetic, which is still in good repute.

On pages 114—116, we find the solution of a problem relating to the velocities of two equal balls, after impact, which appears to have been proposed to him by Mr. Peter Ewart, of Manchester, during "February, 1811." The proposer read a paper on "Moving Force," or "Vis Viva," before the Literary and Philosophical Society of Manchester, about this period, which was afterwards printed in Volume II. of these Memoirs; and since some of the points under discussion were then either little understood or disputed by mathematicians, he very naturally consulted Mr. Mabbott and others respecting the details of the essay, before committing it to press. The same pages contain a memorandum, that Mr. Mabbott was "sworn in as assessor of Manchester, third district, on Wednesday, March 22, 1809;" he had long before been appointed an officer of Excise, and the following letter from his friend, the Rev. Charles Wildbore, editor of the *Gentleman's Diary*, will show that it was probably through his influence that he obtained the situation.

"May 20, 1778.

"Sir,—I received your letter safely, and laid it before a gentleman of my acquaintance, who wrote obligingly to say that he would try to get you into the Excise. If you have in the meantime got anybody else to do this for you, please to let me know; if not, one of the commissioners of the Excise will be down at a noble lord's in this neighbourhood during this summer, and a paper containing your name and place of abode, will be laid before his lordship. It will be proper for you to inform me whether you be of sufficient age, and you may inquire of some excise officer whether anything more is usual to be done on these occasions.

"*You talk of making me amends, but that must only be by your good behaviour.* Pray give my compliments to your father, and accept the same yourself, from

"Your friend and humble servant,

"CHARLES WILDBORE."

"Mr. J. M. Mabbott.

On Mr. Wildbore's death, Mr. Mabbott appears to have obtained possession of some of the mathematical manuscripts left by the late talented editor of the *Diary*, for he subsequently published a very elegant discussion of the whole of the Rev. John Lawson's *sixty* Theorems, by Mr. Wildbore, in Vol. II., of the *Memoirs of the Manchester Philosophical Society*. This essay was originally intended to form a portion of Mr. Lawson's own collection of solutions to his theorems and problems, but on the publication of these being abandoned, the manuscript was returned to its author. The whole of the processes employed in the paper evince the greatest familiarity with the details of the ancient geometry, and its results contain not a few of the properties which have since formed the basis of the beautiful theories of "Radical Axis," and "Poles and Polars" of the continental mathematicians.

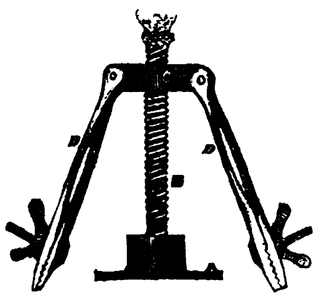
The concluding portion of the manuscript now under review, contains a series of memoranda relating to the manufacture of snuff and other details of his business as an officer of excise; together with an enigma from the *Manchester Journal*, for February, 1776, and a method of computing interest for days, which has since found its way into several of our best and most extensive treatises of arithmetic. Of the second manuscript volume, now belonging to Mr. Buckley, we need only state that it is wholly occupied by solutions to questions which have appeared in the *Diaries* and elsewhere, but their nature is such as not to require any more particular description.

(*To be continued.*)

GOLDING'S APPARATUS FOR BLOCKING AND LASTING LEATHER.

Mr. G. H. Golding, of Maidstone, has recently patented a very serviceable tool or apparatus for blocking and lasting leather, which, no doubt, will come into very general use. The necessity for a cheap and effective apparatus of this kind was very clearly pointed out by a correspondent, at page 266 of our 33rd volume, and that Mr. Golding's meets the requirements of the case there is no question. It consists of a central screw threaded rod, supported and held at bottom in a bearing in which it is free to revolve; the bearing itself being held in a horizontal piece with two or more holes for the passage of nails or screws. The screwed rod carries a cross head, with an internal thread corresponding with that on the rod, and to each side of the cross head is connected a pair of arms made to terminate in a grasping or nipping head. The two plates forming this head are brought nearer to, or separate from each other, by a tightening screw and nut. The operation of blocking, for instance, is performed as follows:—The horizontal plate is screwed to the back of the block, the cross head is placed at the bottom of the rod, and the two lower corners of the leather are gripped by the nipping head, where they are securely fixed by turning down the nut on the tightening screw. The screwed rod is made to revolve, whereby the cross head is made to travel up the rod, taking with it the nipping heads, and thus gradually bringing the leather into the form of the block. From what has

Fig. 1.

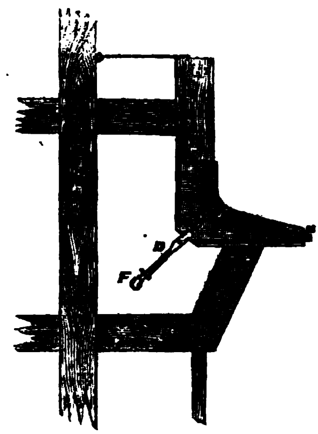


been already stated, it will readily be understood in what manner the tool will operate, in other cases where two ends or sides have to be drawn over a shape or block.

Fig. 1 of the accompanying engravings is a view of the tool. A is a step or bearing in which the central screwed rod, B, is fitted, and in which it is free to revolve; C is a cross head threaded through the centre with an internal thread corresponding to that on the rod. D D are arms connected to the cross head. These arms terminate in two plates roughened in the inside, and made to grip any article between them by the tightening screw and nut, E E. F is a thumb piece, in which the central rod terminates, whereby it is caused to turn.

Fig. 2 shows the tool applied to the blocking of a piece of leather. G is the block held in the frame, H H; I is the

Fig. 2.



leather, the front of which is pressed over a pin, *a*, at the front of the block. The tool is fixed by screws passing through the sides of the step, A, into the heel of the block; the ends, *b b*, of the leather, are gripped and held between the jaws of the arms. The leather is damped and worked somewhat into the shape of the upper part of the block, and it is gradually pulled into the form shown in the figure by turning the screwed-central rod of the tool, whereby the cross head, and with it the arms and ends, *b b*, of the leather, are drawn back.

BARTLETT'S MACHINERY FOR DRILLING AND BORING STONE.

Mr. T. Bartlett, C.E., of Chambery, Savoy, Sardinia, has recently invented an apparatus for drilling and boring stone, in which the drilling or boring is produced by a series of blows, communicated to the drilling or boring bit by means of compressed air. For this purpose he employs a steam engine, the piston-rod of which is continued beyond the piston, and, passing through a stuffing-box at the bottom of the cylinder,

carries a second piston which works in a second cylinder, in which also works another piston attached to a rod that carries the drilling or boring bit. Thus, it will be seen, that at each stroke of the steam engine the air between the two pistons in the second cylinder will be compressed, and the bit and its piston be driven forward. Connected with the latter cylinder is a weighted valve, which allows some of the air to escape, so that on the return of the piston worked by the steam engine, a partial vacuum will be produced behind it; and this will cause the drilling or boring bit to exceed a short distance, and as the piston arrives at the end of its stroke it passes over a hole in the cylinder, which admits air to supply the place of that which was forced out through the valve. In order to give rotary motion to the bit, the rod which carries, it which is round, with a slot or key-way cut in it, is made to pass through a similarly formed collar, to which is fixed a toothed wheel which receives motion, by suitable gearing, from the crank shaft of the steam engine. On this crank shaft is also fixed an eccentric which works a force-pump which supplies water to the boring bit, forcing it down its stem, which is made hollow for the purpose; or the water may be supplied by a pipe direct from the pump. In order to allow the apparatus to move forward as the work progresses, it is mounted on a carriage which runs on a suitable fixed framing, on which is formed a toothed rack, and into this rack a pinion attached to the carriage gears. The pinion is connected by gearing with a ratchet wheel which is rotated, tooth by tooth, by a driver worked by an eccentric on the crank shaft of the steam engine.

SIR JOHN HERSCHEL AND THE SOCIETY OF ARTS EXAMINATIONS.

The following letter has been addressed by Sir J. Herschel to the Secretary of the Society of Arts:

"Collingwood, March 19.

"Sir,—I cannot have the smallest objection to stating the grounds on which I have subscribed the declaration of confidence in the certificates of proficiency about to be awarded by the Society of Arts to the young men who offer themselves for examination as proposed in the circular accompanying it. It cannot but be of very great importance to those who have situations to fill up in the several departments of active life to obtain a knowledge, independent of the partial opinions of recommending friends, of the positive qualifications of the young persons who may offer themselves as candidates for such situations in the immense majority of cases when such tests of merit as university honours or distinctions of a similar kind are out of the question. This is a want on the part of the public as yet unsupplied, and the example of what is being attempted in the departments of the civil as well as military service of the country may, I think, very advantageously be followed in commercial and industrial pursuits of a private nature; and I think the Society of Arts, by volunteering the initiative in undertaking this duty, is doing good service to the country. My confidence in the fairness and impartiality of the awards is based on the publicity of the whole proceedings, on the high character of the society, and on the list of examiners, which comprises many names which I consider as guarantees for the rectitude and uprightness of their awards, and for the reasonable conduct of the examinations themselves in reference to the objects to be attained.

"I have the honour to be, Sir,
"Your obedient servant,
"J. F. W. Herschel.

"The Rev. J. Booth, Chairman of the Council of the Society of Arts."

CAUSE OF THE CONFLAGRATION AT COVENT-GARDEN THEATRE.

To the Editor of the Mechanics' Magazine.

"They all gravely asserted that the truth would never be known, which from the utter and absolute destruction of everything, appeared more than probable."—*Household Words.*

Sir,—When the morning newspapers of Tuesday, March 4th, announced the completion of the first instalment of Mr. Anderson's monster benefit, and promised "this evening, a fit and very splendid conclusion," I apprehend they had but little idea how "very splendid" that conclusion would be! "There appeared something so preposterous," says Mr. Dickens in his amusing narrative, "in the idea of Covent-garden Theatre ever being burned down—ever becoming a prey to the devouring element, that I simply expressed my disbelief in the announcement." Nevertheless, that destruction is a *fait accompli.* For

"London's sons in night-cap woke,
In bed-gown woke her dames;
For shouts were heard mid fire and smoke,
And twice ten hundred voices spoke—
'The playhouse is in flames!'"

leaving but a mass of smoking ruins, attractive enough, however, to have been honoured with the visits and inspection of royalty.

The ruin was irretrievable, and it became highly desirable to ascertain, if possible

the cause of a conflagration which had, in a few short hours, destroyed "the most magnificent lyric temple in Europe." For this purpose, therefore, Mr. Bedford, the coroner for Westminster, exercised the doubtful and much disputed right of holding an official *Court of Inquiry*, which, says a morning paper, "has been brought to what must be considered a most lame and impotent conclusion. Under the direction of the coroner, the Jury, after three days' arduous investigation, have returned their verdict—that there is no evidence to show how the fire originated." It was painfully evident to most persons present, that the worthy coroner was by no means "well up" in the conduct of this investigation. The Editor of the *Builder* complains, and most justly, of the absence of plans or diagrams, and of the excessive loss of time, and confusion of witnesses, which such adjuncts would have obviated, observing, in conclusion, that "if facts are to be elicited in such inquiries, the present roundabout way of getting at them must be altered." Sad, very sad was it to hear such questions put to witnesses as the following:—What is the size of a vitriol carboy? are carboys made of wood or earthenware? was the electric light brought in carboys? how was the gas conveyed to the electric light? are there any substances which, by contact with sulphuric acid, produce combustion?* is vitriol combustible? &c. One thing, however, is quite certain, however defective the inquiry may have been, the Jury could not, upon the evidence, come to any other conclusion than they did. The mass of the evidence was, as the coroner truly observed, of a decidedly negative character; nevertheless it proves, to some extent, how the fire *did not* originate, and thereby, in my opinion, furnishes some clue to its real origin. The following causes have been suggested as originators of the mischief, and each has its supporters;—An escape of gas; the heat from the chandelier; ignition of the flies by the gas-battens; and spontaneous combustion! Let us briefly examine the grounds which exist for attributing the fire to either of these causes. That the *gas* was the moving agent, was at first strongly believed; but that the fire was not occasioned by any escape of gas was the opinion of most (of all the intelligent) witnesses, and a little consideration will tend to show that the fire could not have been thus occasioned. That there was an escape of gas is generally admitted, but it was stated to have been very trifling; "not more" (says the fireman Castles) "than was to be expected from ordinary wear and tear." Not more than is considered almost unavoidable from such innumerable joints and such ramified and extensive fittings. The powerful draught upward through the ventilating shaft, was described as capable of carrying off rapidly, and in safety, a very much larger escape of gas than was actually present. But if not, any extensive escape and collection of gas must have resulted in an explosion of considerable, if not of fearful, violence.* The fire, therefore, was *not* caused by an escape of gas!

The heat from the great chandelier, although considerable, was by no means dangerous. A greater heat, and for a longer period of time, had been safely borne on previous occasions; and the place where the fire began, was about 15 feet vertically, and 30 feet horizontally, distant from the chandelier. Had the chandelier ignited the ceiling, the fire must have commenced underneath, and burned up through the floor of the carpenters' shop. That the reverse of this actually took place was clearly proven. The fire, then, was *not* caused by the heat of the chandelier!

The ignition of the scenes or flies by the gas-battens, and the flames ascending by the suspending ropes to the carpenters' shop, is negatived by the same fact—the place and nature of the outbreak. Moreover, the battens and flies were under close and active surveillance until a quarter past 4 o'clock, at which time they were left perfectly safe. Had the suspending ropes become ignited, they would soon have let the machinery fall, and given timely notice of what was wrong aloft. Whereas, nothing fell until after the ineffectual attempt of the firemen to cope with the fire in the roof, when one of them cut the ropes and let fall some of the apparatus. The fire, then, was *not* caused by the gas-battens!

Spontaneous combustion furnishes such a convenient and ready method of accounting for every fire whose origin is involved in any kind of difficulty or obscurity, that we need not be surprised at the aid of this mysterious agent being extensively invoked in explanation of the present catastrophe. Spontaneous combustion (or ignition) requires the presence of certain substances, under peculiar conditions, many of which are well understood. So far as evidence could be obtained, it went to show the entire absence of all such matters, in the spot

* To this question the witness under examination said, "He did not know of any!" It is well known that a drop of sulphuric acid in contact with a mixture of equal parts of chlorate of potash and loaf sugar, produces instantaneous and violent combustion.

* "If such a thing had occurred in this case, it would have rent the roof."—*Evidence of Mr. R. Jones, Engineer to the London Gas Company.*

where the fire began. No cotton waste, greasy rags, tow, oily sawdust, lamp-black, or other acknowledged element of spontaneous ignition, was known to have been in the carpenters' shop; on the contrary, the presence of all such matters is denied. In the paint shop it might have been otherwise, but the fire assuredly did not begin in the paint-shop.

Again, spontaneous ignition, except in the case of violent chemical combinations, is always a slow and smouldering process, capable of being accelerated, it may be, by various circumstances—such, for instance, as increase of temperature—but still slow and smouldering. In the present instance, the carpenters' shop had been recently cleared up, and was described by one of the witnesses as "being clearer than he ever before knew it." No combustibles beyond the wood and shavings were present; and of the latter, the quantity was described as small, and no fire or light of any kind had been there for weeks. It appeared that up to a quarter after four o'clock, a.m., no smoke or smell of fire had been perceived, although several persons had been in positions to detect it if present. Accidental cause for the fire, there appears to have been none; neither is there any good ground for the neglect which has been imputed to the servants of the theatre.

James Castles, one of the firemen, "thought the theatre was set on fire." The reasons he gave were, that "the smoke was not like wood smoke, but smelt like the fumes of charcoal;" and that, "the time at which the fire broke out favoured his supposition." Castles admitted that his experience, as a fireman, had been purely *theatrical;* and one of his brother firemen (Butler) says, "when he entered the shop he did not smell anything extraordinary about the smoke. It was just like ordinary smoke."

The element of *time* is, however, of great importance. If we assume that the fire was wilfully occasioned, we can scarcely imagine that even an incendiary could be so heartless as to fire a theatre while filled with spectators, because the enormous loss of life that would almost inevitably ensue, could in no way add zest to his infernal gratification. Although not wholly impossible, yet is it very improbable that any stranger could have found his way to the carpenters' shop; the inference, therefore, is, that any incendiary must have been a person well acquainted with all the arrangements and peculiarities of the theatre, and, perhaps, well known to many of the employees. Such a person could not have ascended, without great risk of being seen and recognised, until after the flymen quitted their post. The flies were left at about a quarter after four o'clock, and in fifteen or twenty minutes afterwards the fire was discovered, raging with a fury and rapidity amply accounted for by the extreme dryness and high temperature of all the combustible matter among which the flames were revelling, aided by an upward draught, which gave a furnace-like energy to the combustion.

Certain it is, that all the observed phenomena and facts go to support, in a most striking manner, the opinion of Castles—"that the theatre was set on fire," although the perpetrator, and his motive, may be for ever veiled in impenetrable mystery.

Whether it was in the power of man to arrest the progress of the conflagration when first discovered, will also remain unknown. The first fire-cock could not be reached in consequence of the smoke, and an attempt was therefore made to fall back upon a second, but that could not be found! After forty hours of unceasing duty, it would have been unreasonable to look for great exertions, or to expect much energy, especially when the exigency of the occasion demanded an amount of coolness, intrepidity, and practical experience, far beyond what is "purely *theatrical!*"

By the time extraneous aid reached the spot, prompt as its arrival was, a glance was sufficient to show that the theatre was doomed to inevitable destruction, and the greatest exertions were accordingly directed to the more hopeful, and as it proved, successful task of saving the surrounding buildings.

I am, Sir, yours, &c.,

W. BADDELEY.

13, Angell-terrace, Islington,
March 22nd, 1856.

THE LOSS OF H. M. STEAM-SLOOP "POLYPHEMUS" ACCOUNTED FOR BY THE DEVIATION OF THE COMPASSES.

To the Editor of the Mechanics' Magazine.

SIR,—I shall not trouble you with a long disquisition on magnetic induction, to explain the reasons of compass deviations, but briefly show you, by the present case, that it is from a want of a proper and practical knowledge of this science that the *Polyphemus* was lost. Of course, in this instance, if there had been no fog the coast would have been visible, and then no thanks to the compasses, for keeping a right course, as, had they been right or wrong, with land in sight, they would have been disregarded; but with a dense fog, and nothing but the compasses as a guide, the ship is stranded, and then,

and not till then, we have another sad proof of the misdirection of the compass needle.

In the report of the court-martial held on Commander F. P. Warren, Lieutenant Pyne states "that he had looked at the standard compass; it indicated E. by N." Now, as a constant law, the deviations of the compass in the Northern hemisphere in vessels on an eastern or western course is always towards the ship's course, and the nearer that course is to due east and west the greater will be the amount of deviation. So that in a ship on a course E. by N., there will be a deviation to the eastward of the ship's course; hence, as in this case, a slant towards the shore, which, with the aid of a dense fog at the end of a long run, soon brings the ship on the coast lying to the eastward of her course.

I shall not trouble you with any remarks, or pass an opinion on the present mode of adjusting compasses, or "tables of errors;" suffice it to say, that all such appliances, as is evidenced in this instance, as also in many prior, when the subject was less known than now, have not been available to keep the mariner on his right course, and off the rocks.

Had the master of the *Polyphemus* who, doubtless, knew his course to steer well enough, had a practical knowledge of the common and absolute laws of magnetic cause and effect, or compass deviation, he would, in a fog at least, have distrusted such appliances, and given himself a point or two to spare on the safe side; and thus, in the position of circumstances of this case—such as the direction in which the coast lay as to his course, and the known direction of the compass deviation—have saved his ship.

The importance of this subject, and having a case in point, must be my apology for intruding upon your space with the above remarks, hoping that it may be more thoroughly investigated in the proper quarters, and cause seen, that in these days of iron-built ships, mariners should acquire some practical knowledge of the cause and effect in compass deviations, and its never-failing laws and directions, and not trust blindfoldedly to adjusted compasses, as if they were absolute for all circumstances.

I am, Sir, yours, &c.,

THOMAS ALLAN.

1, Adelphi-terrace, London,
March 20, 1856.

THE SMOKE QUESTION.

To the Editor of the Mechanics' Magazine.

SIR,—In your number of this day, just received, I observe a letter, signed, "The Inventor of Gardner's Smoke Consumer." As the writer speaks of "the laws of chemical combination being unaltered," I am led to expect a scientific reference to those laws, when speaking of combustion in furnaces, and in a different form from what might be expected from one of the *Muir* school, who think that the introducing chemistry into a discussion on combustion in furnaces, as "only leading to complication."

Assuming his signature to be deliberately adopted, namely, "The Inventor of Gardner's Patent *Smoke Consumer*," I have to request from him a clear and chemical description of what he means by the term "smoke," which his patent is to consume.

With reference to another passage in the abovementioned letter, where the writer speaks of the "*double furnace*" system, as if it were a novelty, I have only to observe, that it has been adopted in numerous steam-vessels under my management during the last thirty years, and referred to, as such, in my Treatise "On the Combustion of Coal," pages 173 and 224, where illustrations are given of its use, and the reasons for its adoption; and where also I have described it as recommended by Tredgold, and in use in Her Majesty's steamers, *Hermes*, *Spitfire*, and *Firefly*, see pages 85 and 377; and again as recommended by Peclet in his elaborate work.

I am, Sir, yours, &c.,

CHAS. W. WILLIAMS.

Dublin Steam Company, Liverpool,
March 21, 1856.

CHATTAWAY'S BUFFING AND COUPLING APPARATUS.

To the Editor of the Mechanics' Magazine.

SIR,—I notice a letter in your last week's Magazine, signed "Americanus," in which, in adverting to my buffing and coupling apparatus, he claims the invention for the United States.

I am well aware that the principle of centre buffing has been carried out in America for many years past; but, from no sources of information at my command, can I learn that the combination of the buffer with the drawhook, upon one central rod (which is the distinguishing feature of my invention) had ever been adopted until introduced by me. A model of the apparatus was shown last year to an eminent American engineer, and he certainly was not cognizant of any similar mode of buffing and coupling being then in operation in that country. And as no similar mode had ever been brought to my own knowledge, I cannot relinquish my claim to the merit, if any, of the invention. Perhaps "Americanus" will be good enough to state if the apparatus he saw in the States was a buffer

and drawhook combined, and on what railway it was in operation.

I am, Sir, yours, &c.,
E. D. Chattaway.

Edinburgh, March 18, 1856.

THE GLASS-DIAL CLOCK.

To the Editor of the Mechanics' Magazine.

Sir,—I think the action of the clock spoken of by a "Constant Reader" may be explained by the following supposition.

Suppose that in the bob-end of each of the hands is concealed a good time-keeping watch movement, the weight of which is balanced by the length of the pointer end. On the cannon pinion (that which carries the minute-hand) of the watch movement in the long-hand, fix a lever with a weight at the end farthest from the centre of motion, and another weighted lever on the hour-wheel of the movement in the short-hand; if the hands were in balance before, they will now, if freely suspended, indicate *some* time, according to the position of the weights, which, by the progressive motion given by the watches, continuously destroy the equilibrium of the hands, which gravitation as continuously restores.

I am, Sir, yours, &c.,
Horatio Broadstadt.

MECHANICAL LOCOMOTION.

To the Editor of the Mechanics' Magazine.

Sir,—Your correspondent, "C," and Mr. Cheverton, having opened the question of Mechanical Locomotion, I request the insertion of a few words on this interesting topic.

The gentlemen who have commenced this discussion have begun by complaining, correctly enough, of the general prevalence of great confusion in the ideas of many mechanicians on this subject. To correct this confusion, Mr. Cheverton wishes to establish the journal of the axis as the *fulcrum* of the forces applied. "C." brings forward an explanation which seems highly satisfactory to himself, but which I confess my utter inability to comprehend; and in your last number, "J. H." proposes the hypothesis of two *fulcrums*, one the journal of the axis, and the other (in the case of locomotive railway engines) the rail.

Now on the true principles of the mechanics of uniform motion every one of these explanations is as faulty as the original confusion of ideas they were intended to obviate. In what sense do your correspondents use the word fulcrum? The original meaning of the term fulcrum is a fixed point of support in a lever; and however the lever itself be supposed to move, this point is permanently fixed. Of course, your correspondents cannot attach this meaning to it, although they seem to have an idea that it possesses some extraordinary properties in relation to the forces employed. Judging from the general style of their remarks, I conclude that some of them, at least, conceive the fulcrum to be some point in the moving body which is momentarily at rest. This, in the case of the locomotive railway engine, is the point in the wheel successively in contact with the rail. But this possesses no peculiar property with regard to the forces applied. It serves, no doubt, to fix upon the mind a more accurate and definite impression of the nature of the motion to determine this point; but it does not help to illustrate the action of the forces; it is rather a consequence of their action and of the nature of the rigid connection of the system.

In the case of a *strictly uniform* motion, that is, where the power exerted and the resistances to be overcome are subject to no variation, then at every moment the forces applied (including the resistances) must be such as, if applied to the engine or moving body at rest, would keep it at rest. In such a case, any *point* whatever in the body (the forces being supposed to act in or parallel to one plane) possesses the property of a fulcrum; that is, the sum of the moments of all the forces which tend to move the body round it in one way, is equal to the sum of the moments of those forces which tend to impress an opposite motion. It is true that in solving questions of this kind, mechanicians generally fix upon particular points from which to take the moments; but these are chosen, not on the principle that they have any innate mechanical properties, but that the moment of some force, the determination of which is not requisite for the solution of the problem, disappears by the choice.

Thus, in the case of the common lever, in which the ratio of the power to the weight only is required, the moments are taken about the fulcrum; but if, besides, the pressure on the fulcrum were required, this would be readily obtained by taking another equation of moments about some other point in the lever—the point of application, for instance, of either the power or the weight.

To make this clearer, take the case of the oar used in propelling a boat, the illustration founded on which, as laid down in the elementary portion of works on mechanics from time immemorial, gives such offence to Mr. Cheverton. Here I may say, that for reasons I shall presently state, I do not conceive this illustration as giving a suffi-

cient account of the boat's propulsion. Looking upon the matter, however, from Mr. Cheverton's point of view, and looking only for a fulcrum on the supposition that at any moment of the oar's motion the forces applied to it would be in equilibrium, it matters not *what* point in the oar he selects for the purpose.

If the object were to obtain a relation between the power applied and the pressure on the rowlock, then undoubtedly the point of application of the third force, the resistance of the water, would be advantageously assumed for centre of moments or fulcrum, and we obtain a lever of the second order.

Calling

P the pressure applied by the hand of the rower,

Q the resistance of the water,

R the pressure on the rowlock,

$a+b$ the length of the oar from the point of application of P to that of Q,

a the distance from point of application of P to that of R,

c the distance from the former of these points of another point in the oar—for simplicity's sake, suppose between the hand of the rower and the rowlock, and any one of the four following equations is true.

$$P(a+b) = Rb \quad \text{(I).}$$
$$Pa = Qb \quad \text{(II).}$$
$$Q(a+b) = Ra \quad \text{(III).}$$
$$Pc+R(a-c)=Q(a+b-c) \quad \text{(IV).}$$

In the first of these the point of application of Q is taken as fulcrum, and therefore Q disappears; in the second the point in contact with the rowlock is fulcrum, and R disappears; in the third, the point of application of P is taken for fulcrum, and P disappears; and in the fourth, a point which is not the point of application of any of the forces is taken for fulcrum, and all the forces appear in the equation. The reader who is at all acquainted with algebra will easily convince himself of the compatibility of these four equations, as he will find that any one can be readily obtained by combining together any number of the other equations; consequently the question of the fulcrum to be employed, and therefore of the class of lever, will depend entirely upon which number of the *three* forces we wish to establish a relation between. I repeat, therefore, that if we could consider the oar to be acted on by invariable forces, the ratio of the propelling force on the rowlock to the force exerted by the rower would be correctly obtained by considering it a lever of the second kind, as generally represented by way of illustration in mechanical books.

The fact is, that in all cases of engines used for the purpose of propulsion, there is no such thing as strict uniformity in the propelling force; but it is continually undergoing some change, while the resistance to be overcome is generally uniform. At no one instant of the motion, then, will the relation among the forces, calculated on the supposition of a strictly uniform motion, be correct. We are, therefore, driven to the application of another mechanical principle. I have had to ennunciate this so frequently in your pages, that I am almost afraid of tiring your readers by the repetition. It is this, that the work done by the moving force during the time it undergoes the complete cycle of its changes is equal to the work done by the resistances to be overcome in the same time.

I can now explain why the account of the effect of an oar in propelling a boat, considered simply as a lever acted on by uniform forces, is unsatisfactory. It is that the forces cannot be considered strictly uniform, especially the resistance of the water, which always acts perpendicularly to the face of the oar.

Making use of the notation introduced above—if also 2 a be the angle through which the oar moves,

A the effective area of the immersed portion of the oar-blade, and

B the effective midship section of the boat,

The work done by the power will be easily seen to be represented by $2\,P\,a\,\sin.a$.

The work done by the resistance of the water is (supposing the oar to move round with a uniform angular velocity ω, and the boat to move with velocity v).

$$Ab\left\{2\,b^2\omega^2a-4\,b\omega v\sin.a+v^2\left\{a+\frac{\sin.2a}{2}\right\}\right.$$

Hence we have

$$2\,P\,a\,\sin.a=A\,b\left(2\,b^2\omega^2a-4b\omega\,v\sin.a+v^2\left\{a+\frac{\sin.2a}{2}\right\}\right)\ \text{I.}$$

$$\text{and}\ B\,v^2=A\,b\left(2\,b^2\omega^2\sin.a-2b\omega\,v\left(a+\frac{\sin.2a}{2}\right)+\tfrac{4}{3}v^2\sin.a\right)\ \text{II.}$$

I must, in conclusion, express my conviction that the prevalent confusion of ideas complained of, and undoubtedly existent, must find its remedy, not in vain hunts after fulcrums founded on shallow, insufficient views of mechanics, but in a thoroughly sound, comprehensive grasp of that science of which no one who has to do with

mechanics, or who is ambitious enough to aim at a mechanical invention, ought to be destitute.

I am, Sir, yours, &c.,

W.

London, March 24, 1856.

To the Editor of the Mechanics' Magazine.

Sir,—The letters of Mr. Cheverton and of "C.," lately published in your Magazine, have attracted my attention, and made me desirous of saying a few words on the subject to which those letters relate. And in order to render my communication less unworthy of insertion in your Magazine, I will endeavour, as much as possible, to avoid that common egotism of ascribing to everybody else ignorance and confusion of ideas on matters of elementary science, or even of common experience, and claiming for self only those clear conceptions and correct habits of thought which enable one to observe and register experience accurately, and to reason correctly and logically on the acquired materials.

The answer to "C.'s" difficulty, which you gave a week or two back, in your "Notices to Correspondents," in my opinion, was quite satisfactory, so far as it went; and this "C." himself would doubtless perceive, if he gave careful and unbiassed attention to the subject. More, perhaps, it would have been necessary to say, in order to convince your correspondent of the real character of his error, as correct notions of mechanics and mechanical laws can very seldom be communicated to a beginner by means of a dozen or two of words, much less to one who has preconceived, and not unexceptionable, notions on the subject. Mr. Cheverton has, it seems, entered the field to supply this supposed defect. To criticise his attempts is the main object of my letter. The second sentence in his letter is, to my mind, quite erroneous. I cannot see how your notice implies any such bewilderment, on the part of your former correspondent, as is here alluded to. Another difficulty I have is, to be assured that Mr. Cheverton is himself altogether free from confusion of ideas on the same subject. He says, "Some fifteen or twenty years since, I took part in a discussion in your pages, on this very subject, on which occasion I proved that the difficulty has arisen from the very prevalent idea that the rail, the road, or the water, as the case may be, is the fulcrum of the locomotive lever." Here is, again, a difficulty, in which I am involved. I cannot, by any effort, at present, understand how the perception of a fact so evident can lead to confusion or bewilderment. That the rail, in the case of a locomotive, best answers to the notion of fulcrum, appears at first sight so natural, and becomes when reflected on so certain, that I have here my greatest difficulty of all—that of imagining how Mr. Cheverton could possibly have proved that the prevalence of real knowledge in this matter has caused the disorder of mind which he writes to remedy. There is no real difference whether you regard the rail or the axle as the fulcrum of the lever; the forces acting bear exactly the same relation to one another, as everybody, who understands an equation of moments, knows.

The concluding paragraph in Mr. Cheverton's letter seems, to my humble comprehension, without any point whatever; for I cannot see anything in these discussions to show that theory and practice are at variance, nor can I see that elementary works on mechanics are wrong in teaching that the rower has the "water for a fulcrum, and a lever of the second order for his oar."

With regard to "C.'s" letter, I would say a word or two. It contains the following sentence, to which I wish to call the attention of its author:—"I wish to suggest to him, and to those in general who take an interest in this important subject, a simple hypothesis, by means of which I think that this difficulty may be cleared away, without resorting to supposition, or to anything less certain than the most rigid application of the common laws of science." Now, this notion of an hypothesis independent of supposition is the most novel one the letter contains; it is the first time I have ever met with it. The mode of regarding the problem in question which "C." gives is, on the whole, correct; but it is not new: it is as old as the hills. Indeed, there is nothing in it essentially different from the ordinary solution. Its results are, as you, Sir, have said, exactly the same as the common ones. Permit me, Sir, to recommend "C." to discard the idea that those who have studied this subject more than he seems to have done are in general more ignorant than he of the truths in its regard.

I am, Sir, yours, &c.,

J. C.

Deptford, March 18, 1856.

To the Editor of the Mechanics' Magazine.

Sir,—Your correspondent, "C." having taken notice of my communication repecting the true position of the fulcrum of the locomotive lever, it seems incumbent on me to add a few words by way of explanation. I cannot say that I can follow the ideas of your correspondent, in what he says about the reactive pressure in the

cylinder alternatively overcoming and being overcome by the crank, according as it changes for a lever of one order to another; and especially of there being, if I understand him aright, a loss of half the power of the engine by such internal reaction; but it appears sufficiently clear by his insisting on the necessity of an *independent* fulcrum, that he considers that the place of external reaction and the position of a fulcrum must necessarily be at the same point. To this particular I need not advert, except to make this passing remark, that possibly the clue to your correspondent's thoughts may be found in the conjecture, that he has overlooked the fact of the locomotive engine being a connected structure, and consequently that the stress of forces on any of its parts can have no direct influence on its motion as a whole, but only indirectly, as instrumental to the development of the ultimate action on the rail.

In all physical inorganic action where motion is produced, there is nothing spontaneous; bodies do not move, but are moved. Hence the necessity of two independent bodies being concerned in the operation; hence the necessity of action and reaction, and of their being equal and opposite; and hence this necessity is wholly unconnected with the introduction of leverage, or the transformation of the power by the change of the factors, force and space, from one proportion into another. Such change cannot make any alteration in the relation of two bodies under the aspect of action and reaction. Thus if your correspondent, "C.," being placed in a carriage, is desirous of moving it, he can do so, by acting with a pole directly on the ground, which is, of course, the point of reaction. But if he wishes to move the carriage with a greater velocity than that of the moving force as exerted by himself, he must convert his pole into a lever acting at a disadvantage. Now the third point which thus arises on the carriage itself, bears a relation solely to the lever that is constituted by its means, and does not alter the previous postulates; the action is still on the carriage, and the reaction on the ground. It is, in fact, the fulcrum of the lever, for, being assumed to be the middle point, it is only thus the admitted increase of velocity can be accounted for. This would be rendered apparent to your correspondent by a diagram of very few lines, if he would please to draw it. This point being that from which alone the power of the lever can be calculated, it is of course its fulcrum.

Suppose the end of the pole were to slip without moving the carriage, "C.," himself, would not then place the fulcrum on the ground. Now, the mere fact of slipping, or the moving of one of the bodies concerned in action or reaction rather than the other, or indeed, of both of them together, changes not the subsisting relations as to the fulcrum—that being a term appropriate only to the functions of the lever, which remains unchangeable. If "C." thinks that it does, I am curious to know where he would place the fulcrum in a paddle-wheel steamer. Is there any theoretical difference in the action of a single oar, exerted on a vessel of heavy burden and practically immoveable, and that of many rowers in the captain's gig? If so, where are we to draw the line between the two extremes?

The abutment or point of reaction, is often, by a license of language, called the fulcrum, on account of its commonly serving that purpose as well as the other; but the assumption thence originated that both points are necessarily identical, has caused a great confusion of ideas, and has arisen, from overlooking those cases in which the moving force is embarked with the moving body constituting the resistance—an oversight which shows how little the realities which practical men have to deal with have been recognised in the learning of the schools. It is true that, for the most part, this may be accounted for by the fact, that science is unable to grasp the complications that belong to practical matters in their ultimate and tangible results; and as it is in this last stage of investigation alone, that theoretical conclusions can possess any positive value, it necessarily arises that the final appeal must be to practice; but this misplacement of the fulcrum of the locomotive lever is a very simple affair, and it is high time, if theory is to be rendered somewhat more accordant with practice, that the error should be banished from books of science.

I am, Sir, yours, &c.,

BENJAMIN CHEVERTON.

To the Editor of the Mechanics' Magazine.

SIR,—I have read, with considerable interest, the letters in your Journal upon "Mechanical Locomotion," and cannot help thinking this question a fair type of the differences that sometimes occur between practical men. That the point at issue is in reality of the simplest kind, there can be no doubt; the only wonder is, how any question could have arisen on so simple a point. It is admitted by all practical men, and fully explained in every text-book on mechanics, that when the power moves with the vehicle, the fulcrum must neces-

sarily be part of the vehicle itself; but it would seem some persons ("C." among the number) cannot agree with this, and hence the question now at issue, which, divested of all technical terms, is nothing more or less than, Does the turning of the driving wheel of a locomotive propel the engine, or the propulsion of the engine turn the wheel? This latter conclusion being the one, it would seem, "C." has arrived at—for in his last letter he says, "With the crank at full power below the centre, and the steam occupying the space between the face of the piston and the front end of the cylinder, and pressing on each with a force of 1000 lbs., I calculate the result to be as follows:—the reactive pressure of 1000 lbs. on the end of the cylinder impels the engine forward;" by this we can understand nothing but that the engine is moved forward, the wheel turning as a necessary consequence. Unfortunately for this course of reasoning, we have the established fact that, 1st. The power of the engine does not vary, excepting what accrues from the varying angle of the crank, while, were "C.'s" reasoning correct, the power must vary enormously, as the power acts at one part of the stroke on a lever of the second order, and at another part on one of the third order. 2nd. That the fulcrum must be some fixed point; and herein lies the mistake which, I think, "C." has fallen into, and which is, that the rim of the driving wheel acts as a successional fulcrum. Now, a fulcrum means a certain fixed point; the fact of the fulcrum being moved along with the machine, does not interfere with its properties; but whether moved with the machine or not, it must be a certain fixed point: this being granted, the fallacy of a successional fulcrum is at once seen, for although the driving wheel of a locomotive presents some peculiar features, no course of reasoning can be adduced to show that the friction of the wheel and rail acts as a successional fulcrum; or, in a word, as a movable fulcrum. Until "C." can show that this is possible, I think most practical men will adhere to the established opinion that the axle is in reality the fulcrum in a locomotive.

Apologizing for thus trespassing upon your space,

I am, Sir, yours, &c.,

JNO. TRURAN.

March 17, 1856.

To the Editor of the Mechanics' Magazine.

SIR,—I beg to suggest the following definition:—*The fulcrum of a lever is the point where that force acts which is external to the system to which the lever belongs.*

Thus, in the driving-wheel of a locomotive, the point of contact with the rail is the fulcrum, since the friction exerted by the rail is external to the engine. If we consider the circumference of the wheel as a regular polygon of an infinite number of sides, we see that each angular point in succession becomes a *motionless* fulcrum during an infinitely small instant.

If the whole engine be lifted off the rails, we must consider all those parts of it which do not impart motion to any other parts, such as the axle of the driving-wheel, as rigidly connected with the earth; therefore the force exerted by this axle on the wheel is external to the moving system; this axle is therefore now the fulcrum of the wheel.

In the case of an oar propelling a boat, the point of contact with the water is the fulcrum, according to the above definition. It is not a motionless fulcrum, but it will become so if we suppose that the water begins to run, in the sense of the boat, with a velocity equal and directly opposite to that of the fulcrum; and the motion of the boat, with respect to the water, will not be altered.

I hope these few words may contribute to prevent the subject becoming one of controversy, and shall therefore be thankful if you will insert them.

I am, Sir, yours, &c.,

C. J. RECORDON.

Cambridge, March 25, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

STOCQUELLER, J. H., and W. J. B. SAUNDERS. *Improved mechanical means for obtaining elevations.* Patent dated August 16, 1855. (No. 1856.)

This invention consists chiefly in using three sets of levers on the "lazy tongs" principle, so fastened or secured together as to admit of their being operated upon by considerable force, and rendered capable of sustaining considerable weight when elongated in a vertical position.

ROWLEY, C. *Improvements in elastic bands.* Patent dated August 16, 1855. (No. 1861.)

Claim.—The making of elastic bands by cutting India-rubber into strips or strands, dividing such strips or strands into suitable lengths, and uniting them together at the ends as described.

FAWCETT, W., and F. B. *Improvements in the manufacture of carpets and similar fabrics, and in apparatus used therein.* Patent dated August 16, 1855. (No. 1864.)

This invention has reference to the manufacture of looped or cut-pile fabric, and consists,—1. In an arrangement for mixing the colours of the woollen warp or thread, so as to produce a variety of shades, the effect of which is obtained by the stamping or reading in the pattern, so as to raise two or more threads of different colours at once in each longitudinal division of the reed or slay, thus mixing the colours as fine again as the scale or count of the cloth. 2. In the employment of a long male or eye in the jacquard harness so as to allow the figure warp or worsted to be moved up and down within the said male or eye, through the medium of the heald, when the jacquard harness is arranged close to it. 3. In an arrangement for shifting the position of the shuttle, so as to move on the back of the cloth, instead of raising the figure warp as at present. 4. In a mode of arranging the hanging weights in connexion with the bobbins, so that they may be placed at the back thereof instead of the front, as has heretofore, for the most part, been the practice, the said weights being furnished with pins or bars so as to press against the bobbins when the weights are down. 5. In tuning or regulating the time for raising the whole of the jacquard harness, when the trap board or its equivalent is employed for that purpose, so that the harness may be kept up till the beat-up of the lay takes place, the wire being first inserted before the whole harness is raised, by which arrangement the raising of the warp-threads for the purpose of inserting the wire may be effected without requiring the fall of the trap board. 6. In the employment of certain arrangements in connexion with the bottom board of the jacquard loom for raising the whole harness, as mentioned under the fifth head of the invention. This is accomplished by so timing the cams or tappets which operate such bottom board or bottom cumber board, that the whole of the jacquard harness may be kept up till the beat up takes place, in connection with that order of shedding referred to under the fifth head of the invention, whereby the back shoot is first laid in after each insertion of wire. 7. In a mode of actuating the worsted threads by the jacquard, in order to raise those required for the reception of the wire next to be inserted simultaneously with the raising of the whole harness by the cumber board, so that the whole harness may remain up till the beat-up of the lay takes place, and then for the remainder to drop from those selected for the wire. 8. In tuning or regulating the time for raising the whole of the jacquard harness, when the trap board or its equivalent is employed for that purpose, so as to give the longest time to the entrapping of all the cords, by adapting the hand-loom order of motion. 9. In the employment or mode of using the last-mentioned arrangement, when the whole harness is raised by means of the bottom board of the Jacquard machine. This is accomplished by so timing the tappets for raising the cumber board as to suit the adaptation of hand-loom order of motions, referred to under the eighth head. The first three heads of the invention refer either to hand or power-loom machinery; the six last to power-looms only.

HUDSON, W. *Certain improvements in the construction of stop-rods or protectors in power looms for weaving.* Patent dated August 16, 1855. (No. 1865.)

This invention mainly consists in the construction and application to the power loom of a "stop rod" or "protector," so formed and arranged as to be at liberty to operate only during that part of the revolution of the crank which corresponds with the interval between the entrance of the shuttle into the shuttle-box and the next ensuing pick, so that the motions of the shuttle are unobstructed by it. It is to be used as a substitute for the common "stop rod."

MAYNES, W. *Certain improvements in self-acting temples to be used in weaving.* Patent dated August 16, 1855. (No. 1866.)

This invention relates to self-acting temples which present a continuous bar or straight-edge, parallel to the face of the reed over which the cloth passes, and on which it rests, and particularly to the "trough" or "box and roller" temple, which consists of a long roller revolving in a semi-cylindrical box or trough. There are evils connected with this form of temple. In the first place the necessary thickness of the roller, added to that of the trough, renders the temple bulky and clumsy to apply, it being sometimes difficult to keep it clear of the shuttle race without elevating the edge of the trough more than is desirable. In the second place the cloth passes under the roller by which it is kept out of sight for about 3 in. from the fell, and "floats," or other defects are thus liable to pass undetected for so long a time that a considerable quantity of cloth must sometimes be unwoven in order to rectify them. This invention is mainly intended to remove these defects, and consists of modified forms of the temple. The fabric is supported in a continuous line across its whole width, and the strain on the ends of the warp in shedding is thus equalized, while a better selvage is obtained, and the selvage ends are less liable to break than before, &c.

Baker, W. E. *Improvements in sewing machines.* (A communication.) Patent dated August 16, 1855. (No. 1867.)

Instead of supporting the table or plate of the machine on a stand or frame, the inventor hinges it to the lower one of two parts of a box, so as to form a division in the interior of the box when shut; by this means the machine, when out of use, and the box shut, will be kept free from dirt and dust.

Danduran, J. J. *Improvements in diving apparatus.* Patent dated August 17, 1855. (No. 1868.)

This invention consists,—1. In the construction and employment of a flexible inverted syphon tube for diving purposes, which tube, when passing through the interior of a diving bell, can be made of metal or of a flexible material. 2. In the employment of a ventilator placed at one extremity of the syphon tube, for the purpose of passing off the gases exhaled by the diver.

Brown, D. and J. *New or improved machinery for the manufacture of bayonets.* Patent dated August 17, 1855. (No. 1870.)

This machinery consists of a pair of rolls between which the bar of steel to be formed into a bayonet is passed, the axis of the said bar being parallel to the axis of the rolls, and the rolls having such a sectional figure as gives to the bar a figure roughly resembling the blade, unbent shank, and upset of a bayonet, the surfaces of the rolls being eccentric to their axes. Also, of a combination of three rolls, the peripheries of which are of such a figure as to give a tapering triangular form to the blade of a partially-formed bayonet, and, finally, of a pair of dies, which are subjected to pressure between a pair of plain rolls, and which perfect the form of the bayonet blades.

Collier, G. *Improvements in weaving plush by power, parts of which improvements are applicable when weaving other fabrics.* Patent dated August 17, 1855. (No. 1871.)

This invention mainly consists in so arranging, combining, and operating the parts of a loom for weaving plush by power, that that portion of the pile warp, which for the time is in the lower portion of the shed, may have an increased descending motion given to it, to depress it below the linen or binding warp, in order that the pile warps may clear each other fully up to the formed fabric after each change of the pile warps, &c.

Heys, E. *Improvements in flyers used in preparing and spinning cotton and other fibrous materials.* Patent dated August 18, 1855. (No. 1873.)

This invention consists in tinning the flyers used in preparing and spinning cotton, &c., for the purpose of economising labour in the manufacture of such flyers, and preventing corrosion.

Sangster, W. *An improvement in the manufacture of umbrellas and parasols.* Patent dated August 18, 1855. (No. 1874.)

According to this invention, the cover for each umbrella or parasol consists of one piece without seam. The fabrics used for covers are warp or loop-formed fabrics, made elastic in all directions, by causing the several warp threads not only to loop into each other, but also to continually traverse in the fabric from selvage to selvage. The edge of the cover, between the ends of the ribs, is made non-elastic.

Crawford, R. *Improvements in ornamental weaving by Jacquard looms.* Patent dated August 18, 1855. (No. 1875.)

This invention mainly consists in the use of a pattern block (in place of the endless bands of pattern cards), provided on its operating face with lines of uneven surfaces or recesses of unequal depth, for presenting, by the intervention of rods or needles, draw bars or levers to the action of a reciprocating transverse bar, or its equivalent, and thereby effecting the lifting of the harness to reproduce the required changes in the shed.

Savage, A. *Improvements in the means or mechanism for treating tea, sugar, coffee, chicory, and such substances as require the processes of separation, reduction of size and mixing, or any one or two thereof.* Patent dated August 18, 1855. (No. 1877.)

This invention refers principally to modifications in Savage's noiseless machine for sifting tea, and cutting the large leaves at the same time, and comprises also improvements in mills of the class termed steel or steeled mills, which consist in placing the contrivance used to communicate motion to such mills on the bush or bearing of the same, and connecting it with the axis or spindle thereof, in such manner that no eccentric force may be communicated to the same. Also forming, casting, or forging, of iron or other suitable material, the standard or other part which supports a mill of the aforesaid kind in one piece with the side plate or cheek thereof. Also making those parts of such mills technically termed cores and cases of cast-iron, or other suitable material, covered with wrought-iron, having the teeth by which the grinding is effected formed therein; and making the grinding parts of flat-surface mills (commonly termed plate mills) in the form of segments or annuli of wrought-iron, affixed to masses of cast-iron, or other suitable material. This he effects by casting taper rings or hoops, or flat discs thereof, turning their surfaces, if needful, in a lathe, and, on the surface so prepared, affixing wrought-

iron hoops, segments, or annuli, by screws or otherwise, on which hoops, segments, or annuli, the furrows or teeth are formed, the said teeth being case-hardened in the usual manner.

NORMANDY, A. R. L. M. DE. *Certain improvements in the manufacture of soap.* Patent dated August 20, 1855. (No. 1879.)

A description of this invention will shortly be given.

DUBRULLE, A. *Improvements in safety lamps.* Patent dated August 20, 1855. (No. 1880.)

The improved safety lamp, which can be made entirely of sheet iron, is solid and light. By its peculiar disposition, the oil chamber is wider and lower, so that the level of the oil sinks less rapidly than in the ordinary lamp, while the oil ascends more freely to the wick.

BAIN, A. *An instrument or apparatus for distributing liquids.* Patent dated August 20, 1855. (No. 1881.)

This instrument is a hollow vessel with a flat mouth, into which mouth is inserted a piece of absorbent substance, such as sponge. Liquid placed within the vessel is applied to a surface by means of the absorbent material.

JOURNEAUX, F. *Improvements in drying wheat and other grain.* Patent dated August 20, 1855. (No. 1882.)

The inventor describes apparatus which consists of a shaft or chimney in which is a series of wire cases, around and between which heated air from a fire-place or furnace passes. Across the cases are placed bars of iron to turn the grain from the centre to the sides, that it may all be equally heated. The grain is discharged at the lower ends of the cases by a set of gradually narrowing passages leading into a central passage, and so arranged as to cause the grain to leave each case in oblique streams.

SOELMAN, W. *Improvements in the construction of propellers.* Patent dated August 20, 1855. (No. 1883.)

The patentee describes a propeller designed with a view of employing "the centripetal and the mediolic force," the latter term meaning the force of the water displaced by the "progressive motion of the nave."

KNIGHTON, H. *An improved construction of portable drill.* Patent dated August 20, 1855. (No. 1885.)

The chief object of this invention is to facilitate the boring of wood, stone, and metals in situations where the ordinary hand-drill only could heretofore be used, and it consists in fixing the drill or cutting tool at the lower end of a solid spindle actuated by means of gearing, which spindle is jointed to a threaded spindle above, and may be raised or lowered by hand-wheels. The drill is mounted in a frame on transporting wheels.

GONTIER, P. *Improvements in treating linseed, poppy, and other oils employed in the mixing of paint.* Patent dated August 20, 1855. (No. 1886.)

This invention consists in treating the oils employed in mixing paint, by adding to these oils, over the fire, or when slightly heated, sulphuric acid, resin, and manganese or litharge, thus reducing the number of coatings of paint required.

LONGSDON, R. *Improvements in apparatus to be used for removing property into and out of strong rooms, and in the mode of securing such property from fire or theft.* Patent dated August 21, 1855. (No. 1888.)

This invention chiefly consists in applying hydraulic pressure to the elevation of books, &c., from such strong rooms as are placed below the ground floor of buildings.

LEWIS, G. *Improvements in gloves, cut out with a knife and rotary press.* Patent dated August 21, 1855. (No. 1890.)

The patentee first makes a steel knife of the necessary form for cutting out the materials for gloves, without gussets between the fingers. He next makes a frame furnished with two horizontal shafts connected by a wheel and pinion, one of them having two driving cams keyed on it; there is also a rising bed, lifted up to the cams by counterbalance weights, and provided with anti-friction rollers for the cams to act upon. Finally, he lays several thicknesses of the material to be cut on each other, and by means of a handle on the pinion shaft, forces the knife through the materials, which are then sewn into gloves.

CORNES, J. *An improved method for consuming smoke.* Patent dated August 21, 1855. (No. 1891.)

This invention consists in drawing smoke from furnaces by means of a fan, and forcing it back through a return tube opening below the fire-bars. The fire-place is made by preference in the form of a hopper, or of an inverted conical or pyramidical shape, perforated on all sides and through its bottom.

ORANGE, J. *Improvements in apparatus for covering yarns or other cores.* Patent dated August 21, 1855. (No. 1893.)

This invention consists of a combination of parts for covering yarns, threads, or other cores with silk or other fibrous yarn or thread. The inventor uses a hollow spindle, which turns in bearings, and receives rotary motion by a band or otherwise, and through it the core to be covered is passed. The spindle has fixed on it a disc which carries as many pins as there are covering threads to be employed, the latter being wound on

conical barrels placed on these pins. Beyond the ends of the barrels is fixed on the spindle a disc with as many holes as there are pins, and beyond this disc another similarly perforated. The action of the apparatus will be readily understood.

PAIGE, L. *Certain new and useful improvements in brake mechanism for railway carriages.* Patent dated August 21, 1855. (No. 1894.)

This invention consists of a combination of levers and springs placed beneath the carriage platform, and connected with a brake lever and windlass, and in connecting the rubber of the brake and its bearing, and applying them together, so that the former may extend entirely through the latter, and be capable of being screwed up towards the wheel as it wears.

FIELD, E. *Improvements in presses or machinery for embossing and colouring.* Patent dated August 21, 1855. (No. 1895.)

In this invention the paper is supplied continuously to the press by a series of endless bands driven by rollers, which bands carry the paper beneath the die, where they are retained by a moveable table till the die descends and strikes the impression. For colouring the ground, when desired, a series of inking rollers pass over the surface of the die when it is raised from the paper.

DE BUSSAC, D. *The combination of hydriodic acid, watery or oily, or salts of iodine, with tannic acid, the constituting parts of cinchona, or of sarsaparilla, or of the leaves of the walnut-tree and iron, or with one or several of these bodies.* Patent dated August 22, 1855. (No. 1897.)

The inventor claims the combination mentioned in the title, together with several described methods of forming hydriodated salts.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

WILLIAMS, T. *Improvements in breech-loading fire-arms, and in the mode or method of loading the same.* Application dated August 16, 1855. (No. 1857.)

The inventor proposes, instead of making the guard which covers the trigger fast to the body or barrel, to form a lever of the guard, the fore part of which works in a slot, and is secured by a pivot to the body or barrel, the pivot being the fulcrum. On the fore part of this guard or lever he cuts a toothed segment of a wheel, which acts on teeth cut in an improved manner, which works in a groove parallel to the barrel; and by raising the guard or lever from the back, and drawing it forward, it drives home the ball. The guard or lever is then returned to its place, and the breech turned so as to bring another chamber opposite the rammer. The operation is then repeated till the loading is completed, after which the guard is secured in its proper position by a spring or catch.

JOYNER, C. *A new or improved tap or stop-cock for liquids and gases.* Application dated August 16, 1855. (No. 1858.)

The body of this stop-cock consists of a chamber, divided by a horizontal diaphragm into two compartments; a hole in the diaphragm effects a communication between the compartments. A vertical axis working in the upper compartment carries on its upper end, external to the compartment, a handle whereby the axis may be turned, and the axis carries at its lower end a disc or plate, which works upon the fixed diaphragm. Communication is made between the two compartments by turning the axis so as to bring one of the holes in the disc over that in the diaphragm, and *vice versâ.*

SHANKS, A. *Certain improvements in machines for cutting or shaping nuts.* Application dated August 16, 1855. (No. 1859.)

The inventor employs a revolving cutter placed on a mandril, the nut being fixed on a similar mandril but revolving in a contrary direction, and the axes of both mandrils being in the same plane. One of the mandrils has a sliding or vibrating movement so as to permit the nut to be shaped to the pattern or template affixed thereon.

PAGET, F. *An improved holder for steel or other pens, by which ink is supplied to them.* (A communication.) Application dated August 16, 1855. (No. 1860.)

This invention consists in forming the upper part or handle of the holder of vulcanized India-rubber, or other elastic material, in combination with wood or other rigid material, if necessary. This handle is made hollow and encloses within it a piece of sponge or other absorbent substance, so that the handle shall form a reservoir for ink to supply the pen, and the sponge regulates the supply of the ink according to the pressure applied by the fingers of the writer.

ATHERTON, J., and W. BOYES. *Improvements in looms for weaving.* Application dated August 16, 1855. (No. 1862.)

This invention relates to certain improved modes of locking the reeds of a loom at the time of beating up.

MONK, S. *Improvements in bricks for draining, sewering, and other purposes.* Application dated August 16, 1855. (No. 1863.)

This invention consists in so forming bricks that they shall lap or fit one in the other at the sides or ends.

FENTON, J. *A guard or apparatus to be*

used with moderator lamps. Application dated August 17, 1855. (No. 1869.)

This guard consists of a cone held over the flame just below that part of the chimney where it commences to become narrow, whereby not only is the light increased, but the chimney is less liable to break than where no guard is employed.

EDGE, T. *An improvement in the manufacture of gas meters, and other articles for containing and supplying gas.* Application dated August 17, 1855. (No. 1872.)

The inventor proposes to avail himself of the use of aluminium, either alone or in combination with other metals, forming thereof (by means of the plating process or otherwise) those surfaces which are to be exposed to the gas.

HENRY, O. J. *Improvements in bookbinding.* Application dated August 18, 1855. (No. 1876.)

This invention consists in the preparation of cloth for bookbinding, so as to give it the aspect of leather. The inventor prepares the dressing for the cloth, by passing one or several coats of colours reduced to powder with linseed oil over the cloth, and drying it in a stove heated to 50° or 60° F.

TAVERNIER, F. *Improvements in apparatus employed in combing wool and other fibrous substances.* Application dated August 18, 1855. (No. 1878.)

The improvements relate, (when employing gill combs in lashing apparatus as the feeding means for feeding wool and other fibres into receiving or carrying combs, to the application of a keeping or holding plate or instrument, in connection with the receiving or carrying combs) to press upon and hold the fibre in the teeth.

AVERY, W. *A new or improved method of joining or connecting straps or bands used for transmitting motive power.* Application dated August 20, 1855. (No. 1884.)

In carrying out this invention the two ends of the strap or band are presented to each other, end to end, and two pieces of metal are placed across and cover the joint, one on one side of the strap or band and one on the other. The two plates are drawn together by screws, and their edges, which are turned inwards towards the strap or band, are pressed into the leather, and thus form, and lie in, grooves parallel to the junction.

BROWN, J. H. *Improvements in the construction of ball-cartridges for facilitating the loading and lubricating of fire-arms.* Application dated August 20, 1855. (No. 1887.)

These improvements consist—1. In placing a belt of lubricating material in a groove round the cylindrical base of the bullet. 2. In forming the cartridge or cup (which is rendered impervious to the lubricating material) so that it terminates just above the aforesaid groove. 3. In constructing cases of paper, metal, or other suitable materials, either separately or in combination.

LEWIS, G. *The making of taps and cocks of glass.* Application dated August 21, 1855. (No. 1889.)

This invention is described in its title, as it merely consists in making taps and cocks of glass.

MEINIG, C. L. A., and F. X. KUKLA. *Improvements in ornamenting surfaces.* Application dated August 21, 1855. (No. 1892.)

These improvements consist in transferring oil-coloured pictures on to surfaces of metal, wood, leather, oil-cloth, glass, stone, and other suitable substances, in such manner that the mineral colours are preserved, and that when the substance on which the picture was formed is removed, the colours or inks of the picture remain on the surface to be ornamented.

WORMALD, J., and G. POLLARD. *Improvements in ratchet-braces.* Application dated August 21, 1855. (No. 1896.)

These improvements consist in cutting the ratchet teeth on the interior of the eye of the lever, instead of upon the spindle as usual, two sliding palls or catches being placed in a slot cut in that part of the spindle which is enclosed within the lever eye, and projected by springs.

BLUM, M. *An improved hood.* Application dated August 22, 1855. (No. 1899.)

This invention consists of a sort of great coat, furnished with a hood, which is fitted with a pane of translucent material in front of the face.

SPENCE, W. *Improvements in machinery for dressing and finishing cloth.* (A communication.) Application dated August 22, 1855. (No. 1900.)

This invention has reference,—1. To a machine for raising the nap or pile on the surfaces of cloths. 2. To a machine for brushing or disposing of the fibres of the fabric.

PROVISIONAL PROTECTIONS.

Dated February 20, 1856.

436. David Auld, of Glasgow, Lanark, engineer, and John Stephen of the same place, mill-manager. Improvements in steam boilers and furnaces and in apparatus connected therewith, and in the consumption or prevention of smoke.

Dated February 22, 1856.

458. William Strang, of Glasgow, Lanark, manufacturer. Improvements in ornamental weaving.

Dated February 25, 1856.

475. Bennett Johns Heywood, of Dublin, gen-

tleman. An improved holder for leads, slate, and other marking materials, applicable also as a case for other articles.

477. Joshua Murgatroyd, of Heaton Norris, Lancaster, millwright and engineer. Improvements in steam boilers.

479. Charles Iles, of Birmingham, Warwick, manufacturer. Improvements in pointing hair pins, and in making up hair pins for sale.

483. Joseph Marzolo, of Padua, organ builder. An impressible mechanism, reproductive of movements and applicable to weaving and other looms, and for industrial purposes.

Dated February 26, 1856.

485. John Barrow, jun., of Manchester, Lancaster, manufacturing chemist. Improvements in the manufacture of soda, sulphurous and sulphuric acids, carbonic acid, chlorine and muriatic acid, and apparatus used therein.

487. Samuel Henn and Thomas Haddon, rivet manufacturers, of Gibb-street-works, Birmingham, Warwick. Improvements in the mode or modes of forming or making the heads of ornamental nails, when such heads are formed of a different metal or metals, from the shanks of the same.

488. George Coats, of Glasgow, Lanark, coal master. Improvements in partitions or "brattices" for coal mines and other under-ground works.

489. Fernand Rodolphe Pinor, artist, of Darmstadt, Duchy of Hesse-Darmstadt, for the invention of certain improvements in looms for weaving. A communication.

491. John Cornes, of Swan-lane, London, engineer. Improvements in machines for washing and churning.

493. Francis Thompson, of the firm of Parker and Thompson, of Sheffield, York, tool and patent skate manufacturers. An improvement in skates.

495. George Parry, of the Ebbw Vale Iron Works, Monmouth, furnace manager. An improvement in the puddling and refining of iron.

497. George Tomlinson Bousfield, of Sussex-place, Loughboro'-road, Brixton, Surrey. Improvements in power looms. A communication.

Dated February 27, 1856.

499. Peter Armand Lecomte de Fontainemoreau, of Rue de l'Echiquier, Paris. A new cicatrising preparation. A communication.

503. Edward Ellis Allen, of the Strand. Improvements in the permanent way of railways.

505. Thomas Taylorson Jopling, of Bishop's Wearmouth, Durham, ironfounder. An improved construction of water meter.

Dated February 28, 1856.

507. William Thompson, of Birmingham, Warwick, agent, and Charles Wilson, of Birmingham, manufacturer. An improvement or improvements in buttons, and in attaching the same to articles of dress.

509. Isaac Westhorp, of London. Improvements in concentrating milk and in obtaining concentrated extracts from tea, coffee, and chocolate. A communication from Gail Borden, a citizen of the United States of America.

511. Charles Snow, of Wakefield, York, engineer and surveyor. Improvements in furnaces for steam boilers and other purposes.

513. Elisha Thomas Archer, of Cedar-cottage, Wandsworth, Surrey. Improvements in envelopes for the transmission of letters or parcels.

515. Pierre Louis Grosrenaud, engineer, of St. Etienne, French Empire. Certain improvements in apparatus or furnaces for melting and puddling metals.

Dated February 29, 1856.

517. James Logan, of Liverpool, Lancaster, engineer. Improvements in pumps, which improvements are especially applicable to bilge pumps on board ships and steam vessels.

519. John Markett, of Hastings, Sussex, Lieut. R.N. Improvements in the manufacture of envelopes.

521. John Greenwood, of Rawden, near Leeds, York. Improvements in heating water for the supply of steam boilers.

523. Charles Barlow, of Chancery-lane, London. Improvements in machinery for cutting cloth and other textile fabrics. A communication.

Dated March 1, 1856.

527. Robert Frederick Miller, of Hammersmith, coach-builder. An improved omnibus.

529. Henry Andrew Dewar, Aberdeen, surgeon-dentist. Improvements in conveying or transmitting motion for effecting mechanical operations.

531. Paul Rapsey Hodge, of Albion-grove, Islington, Middlesex, civil engineer. Improvements in the method of lighting domestic fires.

533. Alfred Francis, of Encomb-terrace, Wandsworth-road, cement manufacturer. Certain improvements in the manufacture of a composition applicable as a cement or plaster, and to other purposes.

535. Cyprien Marie Tessié du Motay, of Rue Fontaine St. George, Paris, chemist, and Jean Jacques Fontaine, of Rue Paradis-Poissonnière, Paris, merchant. Improvements in treating cast-iron.

Dated March 3, 1856.

539. Adolphus Oppenheimer, of Manchester, Lancaster, manufacturer. Certain improvements in machinery or apparatus for stretching or distending velvets and other piled goods or fabrics, for the purpose of cutting the pile of such goods.

541. Julius Homan, of Milk-street, Cheapside, London, manufacturing outfitter. An improved mode of driving sewing machines.

543. John Edward Hodges, of Leicester, manufacturer. Improvements in machinery for the manufacture of looped and textile fabrics.

545. John Edward Hodges, of Leicester, manufacturer. Improvements in machinery for the manufacture of looped fabrics.

Dated March 4, 1856.

547. Louis Coddé, of Rue de l'Echiquier, Paris, France, doctor of medicine. A system of submarine communication.

549. Thomas Lambert, of the New Cut, Lambeth. Improvements in apparatus for regulating the drawing off of water and other fluids.

551. Martin Samuelson, of Scott-street, Hull. Improvements in screw propellers.

553. George Lodge the elder, engineer, John Ogden, engineer, and George Lodge the younger, manufacturer, of Leeds, York. Improved apparatus for effecting the consumption of smoke in steam boiler and other furnaces.

Dated March 5, 1856.

555. Richard Dugdale Kay, of Accrington, Lancaster, manufacturer. Improvements in the manufacture of fabrics from fibrous materials.

557. Samuel Last, of Oxford-street, Middlesex, trunk-manufacturer. Improvements in trunks or portmanteaus, and an improved lock for the same.

559. William Green, of York-street, City-road, Middlesex, engineer. Improvements in ornamenting and waterproofing fabrics.

Dated March 6, 1856.

560. Thomas Beatt Sharp, of the Atlas Works, Manchester, engineer, and Thomas Forsyth, of the same place, engineer. Improvements in coupling railway rolling stock.

562. Henry Davis Pochin, of Salford, Lancaster, manufacturing chemist. Improvements in the manufacture of aluminous and siliceous compounds.

563. Richard Philp, of Suffolk-parade, Cheltenham, Gloucestershire, civil engineer. Improvements in paddle-wheels for propelling vessels in water.

565. Robert Morrison, of Newcastle-upon-Tyne, engineer. Improvements in pile driving machinery.

566. Benjamin Browne, of Stockwell, Surrey. Certain improvements in the construction of spindles for locks and latches, and in the mode of connecting the same thereto, and to their respective knobs.

567. Auguste Neuburger, of Rue de l'Echiquier, Paris, France. Extraction of oil from a vegetable substance not hitherto so used.

568. John William Scott, of Worcester, manufacturer of Finch's Patent Solid Leather Button. An apparatus for fastening or securing buttons which may itself be used as a stud or button.

569. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improved method of creating a vacuum, together with certain arrangements of apparatus for preserving substances liable to injury or corruption from prolonged exposure to the atmosphere. A communication from Dr. Giraud.

Dated March 7, 1856.

570. John Downie, of Glasgow, Lanark, engineer. Improvements in moulding or shaping metals, and other materials.

571. Chevalier Guillaume Hähner, of Leghorn, Tuscany. Certain improvements in the treatment of ores. A communication.

572. David Brown, of Smethwick, Stafford, machinist, and William Brown, of Smethwick, roll turner. An improvement or improvements in rolling railway switches from railway bars, and in rolling taper ends or other bars requiring the same.

573. Frederick Hale Holmes, of London, analytical chemist. Improvements in machines known under the name of magneto electric machines.

Dated March 8, 1856.

574. Thomas Cook, of Addiscombe, Surrey, Lieut. R.N. Improvements in portable bedsteads.

575. Henery B. Young, of Barnstaple. Certain improvements in steam engines.

576. Henry Cooke, of Manchester, Lancaster, cotton spinner. Improved machinery or apparatus for dyeing and dressing yarns or threads.

577. Jean Jules Robert, architect, of Portugal-street, Lincoln's-inn-fields, Middlesex. A process which extracts the greasy particles contained in the waters after the cleansing of wools, by the means of sulphate of zinc and arsenicous acid.

578. David Yoolow Stewart, of Glasgow, Lanark, ironfounder. Improvements in moulding or shaping metals.

Dated March 10, 1856.

580. Leon Chablin and Antoine Hennique, of Rue de l'Echiquier, Paris, France. A new mode of ornamenting ceramic and vitreous products.

582. Pierre Hippolyte Gustave Bérard, artificial flower manufacturer, of Paris, France. Improvements in manufacturing artificial flowers and foliage.

584. James Mills, of Oldham, Lancaster, machinist. An improvement in spindles used in certain machines for preparing, spinning, and doubling cotton and other fibrous substances.

586. Joseph Davy, of Manningham, near Bradford, machine maker, and John Milnes, of Clayton-West, near Huddersfield, York. Improvements in looms for weaving plaids, plain weaving and flounces, or other ground-work.

Dated March 11, 1856.

590. Oliver Maggs, of Bourton Foundry, Dorset. Improvements in the straw shaking apparatus of thrashing machines.

592. John Fowler, jun, of Havering, near Romford, Essex. An improvement in the manufacture of bricks and tiles.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

614. William McCarton, of Clarence-place, Dublin, carpenter. Improvements in the drying of corn or grain for grinding and preserving, and apparatus for performing same, and is applicable to drying of other seeds. March 13, 1856.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," March 25th, 1856.)

2551. Fischer Alexander Wilson. Improvements in engines, machinery, and apparatus for exhausting, forcing, and lifting, for propelling on land and water.

2563. William Barnes. An improvement in connecting and supporting the ends of the rails of railways.

2585. William Eassie. Improvements in hammers.

2587. James Yates and Thomas Rawlins Birch. An improvement or improvements in engines for raising beer or other liquids.

2592. John Hosking. Improvements in vertical direct action marine engines.

2600. John Fleetwood. An improved portable apparatus for making malt, and for drying hops, corn, and other grains and seeds.

2613. Francis Puls. A new electric light and heat.

2616. Charles Frederick Clark and Manoah Bower. Improvements in bolts and fastenings, which they propose calling "Clark and Co.'s Longitudinal Wedge Bolt."

2627. William Munslow and Henry Wallwork. Improvements in railways.

2647. John Elce and George Hammond. The employment of a new material in the manufacture of wicks for moderator lamps.

2648. Samuel Ratcliffe Carrington. Certain improvements in the manufacture of hats.

2649. Jean Lobstein. Improvements in sewing-machines.

2661. Frederick Osbourn. Improved machinery for pressing, smoothing, or finishing garments or parts of garments.

2677. John Henry Johnson. Improvements in windlasses, capstans, and other purchases, parts of which are applicable to the transmission of motive power. A communication.

2681. George Richardson. Improvements in chain cables and other chains. A communication.

2684. George Richardson. Improvements in buffer, draw, and bearing springs for railway carriages and wagons. A communication.

2690. James Walker. Improvements in the manufacture of textile fabrics.

2738. William Smith. Improvements in apparatus for regulating the supply of air to furnaces.

2835. John Henry Johnson. Improvements in ships' tillers. A communication.

2909. James Chesterman. An improved spring especially applicable to the joints of knives, razors, scissors, and other like articles.

178. William Johnson. Improvements in the treatment and application of fatty, resinous, and

gummy substances, and in the manufacture of pastes, greases, and soaps. A communication.

302. Matthew Whiting, junior. Improvements in preparing for and in tanning hides and skins.

352. Christophe Muratori. Improvements in the waterproofing of hangings or ornamenting stuffs.

387. Thomas Evans Blackwell. Improvements in condensing steam and in cooling and heating fluids.

436. David Auld and John Stephen. Improvements in steam boilers and furnaces and in apparatus connected therewith, and in the consumption or prevention of smoke.

458. William Strang. Improvements in ornamental weaving.

469. James Warburton. Improvements in machinery for combing wool, cotton, and other fibres.

473. Charles Brook, the younger, and Joseph Hirst. An improvement in finishing yarns of wool or hair, and in the finishing of woven fabrics or piece goods.

474. Louis Normandy. Improvements in the mode of constructing and fixing the rails of railways. A communication.

503. Edward Ellis Allen. Improvements in the permanent ways of railways.

514. Charles Alexandre de Fonbonne. Improved apparatus for the manufacture of coke and for blasting, also for the production and extracting of illuminating and combustible gas, as well as ammoniacal and bituminous matters, part of such apparatus being applicable to the consumption of smoke.

521. John Greenwood. Improvements in heating water for the supply of steam boilers.

524. William Allen Turner. Improvements in the manufacture of elastic tubing.

529. Henry Andrew Dewar. Improvements in conveying or transmitting motion for effecting mechanical operations.

531. Paul Rapsey Hodge. Improvements in the method of lighting domestic fires.

533. Alfred Francis. Certain improvements in the manufacture of a composition applicable as a cement or plaster, and to other purposes.

535. Cyprien Marie Tessié du Motay and Jean Jacques Fontaine. Improvements in treating cast-iron.

543. John Edward Hodges. Improvements in machinery for the manufacture of looped and textile fabrics.

545. John Edward Hodges. Improvements in machinery for the manufacture of looped fabrics.

553. George Lodge the elder, John Ogden, and George Lodge the younger. Improved apparatus for effecting the consumption of smoke in steam boiler and other furnaces.

558. Charles Morgan and Charles Ranken Vickerman. An improved preparation of fuel, and the application of the same to steam boiler purposes.

570. John Downie. Improvements in moulding or shaping metals, and other materials.

578. David Yoolow Stewart. Improvements in moulding or shaping metals.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

685. Samuel Radcliffe and Knight William Whitehead.
689. Thomas Sykes.
699. Samuel McCormick.
710. William Mann Crosland.
712. Charles William Siemens and Joseph Adamson.
721. William McNaught.
739. Samuel Fox.
775. George Ferguson Wilson and James Freeman Lee.
776. George Ferguson Wilson.
779. William Crofts.
783. George Ferguson Wilson.
784. George Ferguson Wilson.
785. George Ferguson Wilson.
792. Frederick William Mowbray.
915. Jean Baptiste Maniquet.
927. Isaac Simpson.

LIST OF SEALED PATENTS.

Sealed March 14, 1856.

2174. William Neufville Martin.
2179. William Illingworth.
2184. William Kempe.
2213. George Frederick Gruet.
2226. Jean Daniel Pfeiffer.
2243. William Rothera.
2520. John Olive and William Olive.
2717. Frederick Walton.
2912. Thomas Cowburn and George Walker Muir.
12. Harvey Lewis Sellers and John Littler Talbott.
85. Alfred Vincent Newton.

Sealed March 20, 1856.

2131. Henry James Harcourt.
2134. John Musto and Frederic Bear.
2138. William Wright and John Wright.
2144. Gustavus Huguenin.
2148. James Nasmyth.
2153. Anaxagor Epaminondas Guilbert and Charles Louis Guillemère.
2162. John Talbot Pitman.
2336. Samuel Statham.
2342. William Tatham.
2456. James Smith Cottrill.
2554. William Webb and John Webb, junior, and James Catstree.
2874. Henry Robert Abraham.
2924. David McCallum.
2928. Alfred Krupp.
42. William Oliver Johnston.
50. Conrad Abben Hanson and John Wormald.
64. Samuel Middleton.
120. John Fowler, junior.
122. Henry R. Worthington.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration. 1856.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Feb. 27	3812	S. Dixon & E. Eyres	Savoy-street, Strand	Cap for travelling bags.
Mar. 4	3813	Sampson Mordan and Co.	City-road	Copying-press and inkstand.
5	3814	W. Sawney	Beverley	Cliver apparatus.
,,	3815	Butterworth and Co.	New Dovor-street	Elastic book-fastening.
11	3816	J. Flanagan	Manchester	Shirt collar.
12	3817	J. Clayton	Denton	Hatter's iron stove.
15	3818	C. and J. Clark	Glastonbury	Boot.
18	3819	J Mertis and Sons	Astwood Bank	Needle-case.
20	3820	W. Heap	Ashton-under-Lyne	Pipe and nut-wrench.
25	3821	F. Cornwall	Birmingham	Coal economising grate.

PROVISIONAL REGISTRATIONS.

Mar. 4	752	F. Wickstead	Upper St. Martin's-lane	Carriage spring.
8	753	R. Leake	Barnsley	Smoke consuming apparatus.
,,	754	H. Cornfoot	James-street	Omnibus.
14	755	J. Coulson	Grantham	Smut and chaffing machine.
18	756	J. Nuttall	Silver-street, Cheapside	Glove pointing printing block.
19	757	E. W. Stone	Birmingham	Castor.

CONTENTS OF THIS NUMBER.

Stanley's Improvements in Weighing Machines—(*with engravings*) 290
Notæ Mathematicæ. By T. T. Wilkinson, Esq., F.R.A.S., &c.—(*continued from p.* 30.) 291
Golding's Apparatus for Blocking and Lasting Leather—(*with engravings*) 294
Bartlett's Machinery for Drilling and Boring Stone 294
Sir John Herschel and the Society of Arts Examinations 295
Cause of the Conflagration at Covent-Garden Theatre 295
The Loss of H.M. Steam-Sloop "Polyphemus," Accounted for by the Deviation of the Compasses 297
The Smoke Question 298
Chattaway's Buffing and Coupling Apparatus. 298
The Glass-Dial Clock 299
Mechanical Locomotion 299

Specifications of Patents recently Filed:

Stocqueller and Saunders ..... Elevating Apparatus 303
Rowley ..... Elastic Bands 303
Fawcett & Fawcett ... Carpets 303
Hudson ..... Power Looms 304
Maynes ..... Loom Temples 304
Baker ..... Sewing Machines ... 305
Danduran ..... Digging Apparatus .. 305
Brown and Brown ... Manufacturing Bayonets 305
Collier ..... Weaving Plush 305
Heys ..... Fibrous Materials ... 305
Sangster ..... Umbrellas, &c. 305
Crawford ..... Ornamental Weaving 305
Savage ..... Treating Tea, &c. ... 305
Normandy ..... Soap 306
Dubrulle ..... Safety Lamps 306
Bain ..... Distributing Liquids 306
Journeaux ..... Drying Grain 306
Soelman ..... Propellers 306
Knighton ..... Portable Drill 306
Gontier ..... Paint-Oils 306
Longsdon ..... Strong Rooms 306
Lewis ..... Gloves 306
Cornes ..... Furnaces 306
Orange ..... Covering Yarns 306
Paige ..... Railway Brakes 307
Field ..... Embossing Presses ... 307
De Bussac ..... Combining Salts and Acids 307

Provisional Specifications not proceeded with:

Williams ..... Breech-loading Fire-arms 307
Joyner ..... Stop-cock 307
Shanks ..... Shaping Nuts 307
Paget ..... Pen-holders 307
Atherton & Boyes ... Looms 307
Monk ..... Bricks 307
Fenton ..... Lamp-guard 307
Edge ..... Gas-meters 308
Henry ..... Book-binding 308
Tavernier ..... Combing Fibres 308
Avery ..... Joining Bands 308
Brown ..... Ball-cartridge 308
Lewis ..... Glass Taps 308
Meinig and Kukla ... Ornamenting Surfaces 308
Wormald & Pollard .. Ratchet Braces 308
Blum ..... Great Coats 308
Spence ..... Dressing Cloth 308

Provisional Protections 308
Patent Applied for with Complete Specification 310
Notices of Intention to Proceed 310
Patents on which the Third Year's Stamp-Duty has been Paid 311
List of Sealed Patents 311
List of Designs for Articles of Utility Registered 312
Provisional Registrations 312

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1704.] SATURDAY, APRIL 5, 1856. [PRICE 3D

Edited by R. A. Brooman, 166, Fleet-street.

DUNN'S DUPLICATE RETORT STEAM BOILER.

Fig. 1.

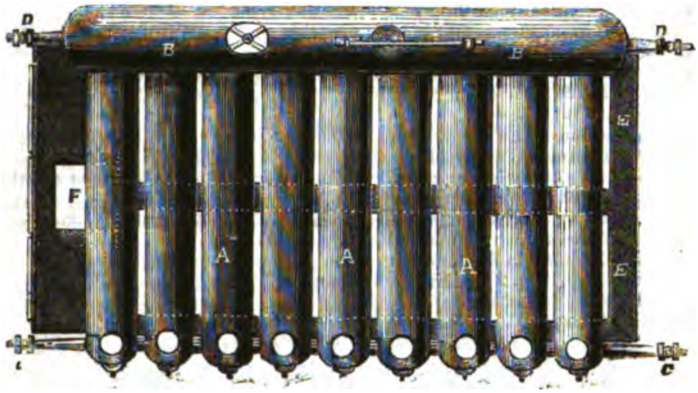


Fig. 2.

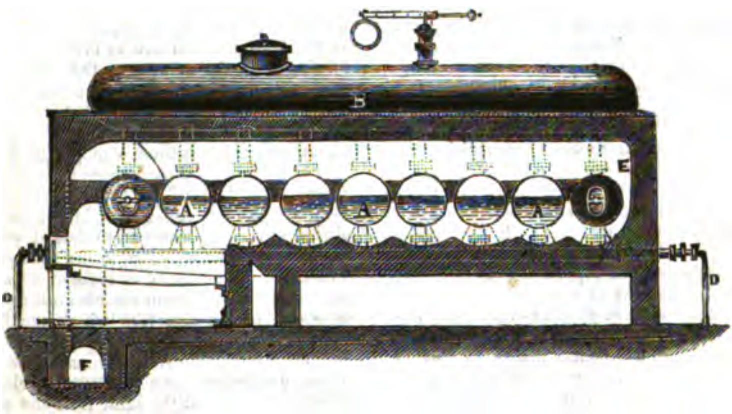
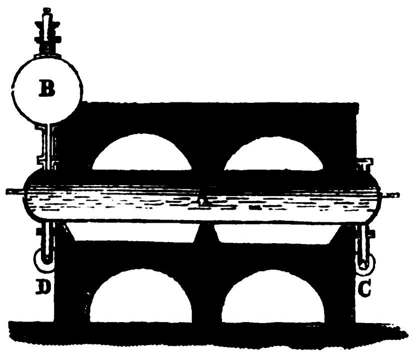


Fig. 3.

Fig. 4.



DUNN'S DUPLICATE RETORT STEAM BOILER.

The difficulties and expenses attending the transit of large steam boilers made on the ordinary construction, in consequence of their unwieldy size, led Mr. T. Dunn, of Manchester, to consider the feasibility of forming a boiler in parts, in such a manner that it should possess the advantages of the ordinary large boilers without their disadvantages. The large boilers in common use weigh in some cases 18 tons, and their bulk is sometimes a greater objection to them than their weight, causing great loss of time and expense. It will, consequently, be apparent that a boiler capable of being readily transported would cause great saving in time and expense in transit. Such a boiler must also satisfy the following requirements:—it must be able to stand a working pressure of not less than 200 lbs. per square inch; and it must be of simple construction, and must admit of being easily repaired.

These conditions Mr. Dunn has attempted to fulfil by a new boiler, described in a paper recently read at the Institution of Mechanical Engineers, Birmingham. It consists of a series of small cylindrical boilers or retorts placed side by side, and connected together by pipes at the extremities, the number of retorts being such that their total capacity shall be equal to that of a single large boiler of ordinary construction. The following description is from the paper referred to.

The new boiler is shown in figs. 1 to 4 of the engravings on the preceding page. Fig. 1 is a plan of the boiler. Fig. 2 is a longitudinal section. Figs. 3 and 4 are transverse sections. A A are the cylinders or retorts, made of the best wrought-iron plates, ¼ inch thick, 9 feet long, and 17 inches diameter; the ends are cast-iron hemispherical caps, ¾ inch thick, riveted upon the cylindrical portion, to which are fixed the cast-iron connections from the steam chest, B, the feet-pipe, C, and mud-pipe or blow-off pipe, D. The retorts are built into the side walls of the furnace at each end, and supported on a saddle of firebrick in the middle; they are placed 1¼ inch apart, the space between them being closed by a wedge-shaped piece of firebrick, leaving the whole of the lower semicircle exposed to the flame, and half of the upper. The plan represents nine of the retorts arranged side by side and across a double furnace. The flame traverses the bottom of all the retorts, and then passes to the top through the double arch, E, returning over the retorts to the front, and thence to the chimney at F. The retorts have thus three-fourths of their surface exposed direct to the flame, and consequently absorb a great quantity of heat. The cast-iron ends are outside the walls of the furnace, so that they suffer no injury from exposure to the flames; whilst their extra thickness keeps in the heat, and renders them stronger than the other parts of the boiler.

The steam chest, B, the feed-pipe, C, and the mud-pipe, D, send off branches to each retort, whereby the steam is carried off equally from all, and an equal distribution of the feed water is produced. The feed water is introduced at the opposite end to that at which the steam is taken off, but the mud-pipe is at the same end as the steam-pipe and the opposite end to the feed-pipe, and thus the boilers can be thoroughly cleared of scale or deposit, as often in the day as may be desired, by simply opening one or both of the blow-off cocks, situated at the ends of the mud-pipe. The opposite end of the retort, at which the feed water enters, is cast with two connections, one of which receives the feed-pipe, and the other is closed by a cover plate; by this means, when the boiler is reversed to equalise the wear, the bottom being turned upwards, the feed-pipe connection then becomes the closed one, and the one previously closed now receives the feed-pipe; at the same time the connections of the steam and mud-pipes at the other end of the boiler are also reversed, merely requiring the flange joints to be broken. Each end is provided with a manhole, and thus the boiler can easily be laid clear open from end to end.

In this boiler there is no internal flue, and no part is exposed to a pressure from without, tending to make it collapse; but all the pressure is from within. The nature of the pressure thus renders the boiler safe, in contrast with those having an internal flue, the danger of which has been experienced in several recent accidents. In one instance the pressure was 45 lbs. per square inch when the flue collapsed, and in the case of a locomotive boiler, having a return flue 30 inches diameter, made of ⅜-inch Lowmoor plate, the flue collapsed and blew up the engine when it had not been at work more than a week.

The retort boiler has no small tubes connected with it, and thus saves the trouble and expense which they occasion, particularly with dirty water or inexperienced attendants. At the same time, there is less tendency to accumulation of deposit, the interior of the retorts being uninterrupted; and in case any dirt should collect, the mud-pipe, D, gives every facility for cleaning out, and the retorts may be examined at any time by means of the manholes at each end.

The peculiar construction of the boiler prevents the adhesion of incrustation or scale of

more than $\frac{1}{16}$th inch thickness to the internal surface, as the contraction from the boiler cooling at night loosens the scale, and the formation of the fresh scale forces it off. Upon removing the manhole doors to clean the boiler, the deposit was found in two of the retorts only, the remainder being almost free from deposit of any kind, after thirteen weeks' constant working.

The small diameter of the retorts increases their strength, and accordingly a boiler of this description is stronger than a single large boiler of equal power. One of the retorts has been proved by hydraulic pressure up to 300 lbs. per square inch without bursting, being at least three times the ordinary working pressure.

The several parts are all duplicates of one another, so that they can be easily replaced when injured or worn out; or the power of the boiler can be increased, when desired, by adding more retorts; and the plain cylindrical shape of the retorts allows of their being reversed so as to equalize the wear.

The new boiler combines with it abundance of furnace room, allowing the more bulky kinds of fuel to be used, such as brushwood, peat, sawdust, or the cheapest sort of coals, and affording space for the addition of any kind of smoke-burning apparatus that may be desired.

A boiler of the above construction has been at work upwards of ten months at the writer's works, in Manchester, and has given complete satisfaction. It supplies steam at a pressure of 50 lbs. per square inch to two engines, one with a cylinder of 8½ inches by 2 feet stroke, making sixty revolutions per minute, and the other with a cylinder of 7½ inches by 18 inches stroke, making eighty revolutions per minute. The indicated horse power of the two engines together is seventeen horse power, the average pressure of steam in the large engine being 28¼ lbs. per square inch, and in the small engine 27 lbs. per square inch. The boiler also works a steam riveting machine, 30 inches diameter, and equal to seven horse power. This, together with the two engines, gives a total of twenty-four horse power. The consumption of fuel is 135 lbs. per hour of ordinary furnace coals, or about 5¾ lbs. per indicated horse power per hour; but the boiler is working at a disadvantage, owing to the length of the steam pipes connecting it with the engines; one being 180 feet long and the other 84 feet, and passing through an open yard. Taking into consideration the loss caused by radiation from this extent of surface, it appears that the new boiler is economical and cheap, as it can be made at the same price as an ordinary large boiler of the same power. Also, in consequence of the small weight of the separate parts of which it is composed, the heaviest of which does not exceed from 7 cwt. to 8 cwt., it can be shipped or loaded for overland transit at the price of ordinary machinery, with an important saving over the large boilers at present manufactured.

FARADAY'S EXPERIMENTAL RESEARCHES IN ELECTRICITY.

(*Continued from p.* 247.)

Faraday proceeds as follows:

"(2783.) *Nitrogen* being the other and larger part of the atmosphere, was then subjected to experiment, and three tubes, one containing the gas at a pressure of 30 inches of mercury, another with the gas at the pressure of 15 inches, and the third reduced as nearly as it could be to a vacuum, were prepared. When these were compared one with another in the magnetic field they were found to be so nearly alike as not to be distinguishable from each other; that is, they remained equidistant from the magnetic axis. I do not mean to imply that nitrogen at these different pressures is absolutely the same, bulk for bulk (an instrument now under construction will enable me hereafter to compare and measure with infinitely greater accuracy, and to ascertain these points); but as compared with oxygen, the great and extraordinary differences produced by rarefaction there have no corresponding difference here. If there are any, they are insensible at present, and may, for the chief purpose of this paper, and the determination of the zero point between magnetics and diamagnetics, be taken as nothing.

"(2784.) Nitrogen therefore appears to be neither magnetic nor diamagnetic.

* * * *

"(2785.) As yet I have found no gas which, being on the diamagnetic side of zero, can at all compare with oxygen in the range of effect produced by rarefaction."

After some very strange observations on "*space*," on which we shall have occasion to make some remarks hereafter, Faraday proposes the introduction of a fresh word, "*paramagnetic*," to distinguish those substances which have been usually called "magnetic" from those which are now known to be "diamagnetic," the word "magnetic" being retained as a *general* term, applicable to both "paramagnetics" and "diamagnetics." Iron, nickel, co-

balt, and oxygen are therefore to be designated in future as "*paramagnetic*" bodies.

It will be obvious to every reader, that the strongly marked character of *oxygen* as a paramagnetic body is a fact of the highest interest and importance, on account of its almost universal presence and activity in all terrestrial phenomena.

"(2791.) From the presence of oxygen in the air the latter is, as a whole, a magnetic medium of no small power. Hence all the comparative experiments on the diamagnetic condition of other gases made by passing streams of them through it and through each other (*Phil. Mag.*, 1847, vol. xxxi., pp. 407, 420, &c.) require a correction which occasionally may place some of these bodies on the paramagnetic side of zero. Even solid and fluid substances may be thus affected; and the preliminary list which I formerly gave (2424) will need alteration in this respect. I hope soon, however, to have the means of ascertaining not only the place of bodies, but also their relative degrees of force at the same and at different temperature, with a degree of accuracy that will serve great purposes in the further development of this branch of science,

"(2792.) Amongst the gases hitherto examined there is nothing that compares with oxygen.

* * * *

"(2793.) I hope to give the correct expression of the paramagnetic force of oxygen hereafter; in the meantime I am tempted to give one or two rough illustrations of its degree in this place, in addition to the former one. The capacity of the oxygen bulb containing one atmosphere is not quite 0·34 of a cubic inch, and the weight therefore of the oxygen within 0·117 of a grain. I endeavoured to compare this quantity in the first place with soft iron, and therefore attached a portion of that metal having one-tenth of this weight, or 0·012 of a grain to a fine platina wire fixed into one end of a vessel corresponding in size to that containing the oxygen, so as to bring the iron into the middle, and then the bulb was exhausted and hermetically sealed. Being now opposed to the oxygen tube in the magnetic field, it was found, as expected, far to surpass the oxygen in magnetic power. As it was inconvenient further to reduce the iron, or to enlarge the oxygen, another magnetic substance was employed for the comparison.

"(2794.) One hundred grains of clean, good, crystallized protosulphate of iron were dissolved in distilled water, and diluted until a glass bulb of nearly the same size as the oxygen bulb when filled with the solution was equal to the oxygen bulb in force, and stood equidistant from the axial line, as far as I could judge by the present modes of observation. When the solution had this strength, it occupied the bulk of 17½ cubic inches. As the bulk of the oxygen is only 0·34 of a cubic inch, that volume of this solution would contain very nearly two grains of crystallized sulphate of iron, equivalent to 0·4 of a grain of metallic iron; so that, bulk for bulk, oxygen is equally magnetic with a solution of sulphate of iron in water containing 17 times the weight of the oxygen in crystallized protosulphate of iron, or 3·4 times its weight of metallic iron in that state of combination." After describing another experiment, which showed a very high magnetic power (comparatively speaking) in oxygen, Faraday concludes this "Series" with the following reflection:

"(2796.) It is hardly necessary for me to say here that this oxygen cannot exist in the atmosphere, exerting such a remarkable and high amount of magnetic force, without having a most important influence on the disposition of the magnetism of the earth as a planet, especially if it be remembered that its magnetic condition is greatly altered by variations in its density and by variations in its temperature.—(*Phil. Mag.*, as before). I think I see here the real cause of many of the variations of that force which have been and are now so carefully watched on different parts of the surface of the globe. The daily variation aud the annual variation both seem likely to come under it; also very many of the irregular continual variations which the photographic process of record renders so beautifully manifest. If such expectations be confirmed, and the influence of the atmosphere be found able to produce results like these, then we shall probably find a new relation between the aurora borealis and the magnetism of the earth, namely a relation established more or less through the air itself in connection with the space above it. And even magnetic relations and variations, which are not as yet suspected, may be suggested and rendered manifest and measurable, in the further development of what I will venture to call *atmospheric magnetism*. I may be over sanguine in these expectations, but as yet I am sustained in them by the apparent reality, simplicity, and sufficiency of the cause assumed, as it at present appears to my mind. As soon as I have sufficiently submitted these views to a close consideration, and the test of accordance with observation, and, where applicable, with experiments also, I will do myself the honour to bring them before the Royal Society." (Pages 198, 199.)

The next two series (the 26th and 27th) of these "Researches" (occupying more than one hundred pages of the volume), are almost entirely taken up with the subject of "Atmospheric Magnetism." We cannot say, however, that Faraday has thrown much light on the matter, or contributed much more than the facts already mentioned in illustration of the subject. The entire series is so full of his own very peculiar ideas about "Lines of Force," that it partakes far less of an "*experimental*" than of a purely *speculative* character; and therefore is the least valuable portion of the "Researches," in our opinion.

If, however, it be true, as Faraday asserts, that "The air which stands upon every square foot of surface on the earth, is equivalent, in magnetic force, to 8,160 lbs. of crystallised protosulphate of iron," (page 225), there can be no doubt that this enormous force must play a very important part in terrestrial magnetism, and be worthy of the most careful and persevering investigation: and we only wish that the subject admitted of that kind of experimental inquiry which can be carried on in the laboratory by one man in one place, and within a moderate period of time. Unfortunately, however, for our curiosity, it requires that the labours of numerous persons in numerous and scattered places on the globe, should be continued for a long period of years. That our author, however, has contributed a most valuable *fact* towards this inquiry, in proving the very high magnetic properties of *oxygen*, no one can doubt for a moment. Nor do we intend to say, that even the mere *speculations* of Faraday on this subject, are useless or uninteresting. On the contrary, we have no doubt that those who are engaged in these investigations will derive both pleasure and profit from this portion of Faraday's work, if merely in the way of *suggestion*. But we cannot conscientiously say that we have obtained much satisfaction from these hundred pages of the volume before us, there being far too much of the merely conjectural and theoretical in them, and too little solid experimental support.

We have noticed, by the way, one extraordinary mistake, which may, perhaps, be nothing more than a casual slip. At page 234, we find the following sentence: "But as the axis of the earth's rotation is inclined 23° 28′ to the plane of the ecliptic," &c. The angle here named is the *complement* of the inclination, or ninety degrees *minus* the inclination of the earth's axis to the plane of the ecliptic: that inclination being 66° 32′. We cannot help once more remarking the want of sound mathematical knowledge in various parts of this and the following "Series," a defect which sadly injures the value of the opinions put forth as to the various phenomena of atmospheric magnetism. As a summary of these views, however, we quote the following from the "Royal Institution Proceedings, April 11, 1851," (pages 325—327 of the present volume):

"On a former evening (January 24) it was shown that oxygen gas was magnetic, being attracted towards the poles of a magnet; and that, like other magnetic bodies, it lost and gained in power as its temperature was raised and lowered, and that the change occurred within the range of natural temperatures. These properties it carries into the atmosphere; and the object, this evening, was to show how far they might be applied to explain certain of the observed variations of the terrestrial magnetic force. If a source of magnetic power be considered (as a magnet) it presents us with a system having polarity; and if the parts which are called the poles be taken as representing the most concentrated condition of the polarity, then the contrary polarities, manifest externally in relation to the magnet, are perfectly definite, being exactly equal to each other. If the magnet be irregular in the disposition of its force, still the same definite character of the sum of the contrary polarities holds good.

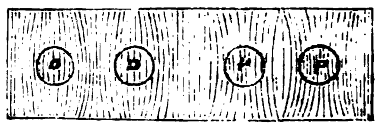
"External to the magnet, those concentrations which are named poles, may be considered as connected by what are called magnetic curves, or lines of magnetic force existing in the space around. These phrases have a high meaning, and represent the ideality of magnetism. They imply not merely the directions of force, which are made manifest when a little magnet, or a crystal, or other subject of magnetic action is placed amongst them; but those lines of power which connect and sustain the polarities, and exist as much when there is no magnetic needle or crystal there as when there is, having an independent existence analogous to (though very different in nature from) a ray of light or heat, which, though it be present in a given space, and even occupies time in its transmission, is absolutely insensible to us by any means whilst it remains a ray, and is only made known through its effects where it ceases to exist. The form of a line of magnetic force may vary exceedingly, from a straight line to every degree of curvature, and may even have double and complicated curvatures impressed upon it. Its direction is determined by its polarity, the two changing together. Its powers are such, that a magnetic needle placed in it finds its place of rest parallel to it. A crystal of calcareous spar turns until its optic axis is transverse

to it; and a wire which is unaffected when moved in or along it, has an electric current evolved the instant that it passes across it. By these and by other means the presence of the magnetic line of force and its direction are rendered manifest.

"The earth is a great magnet, its power, according to Gauss, being equal to that which would be conferred if every cubic yard of it contained six one pound magnets; the sum of the force, therefore, is equal to 8,464,000,000,000,000,000,000 such magnets. The disposition of this magnetic force is not regular, nor are there any points on the surface which can be properly called poles; still the regions of polarity are in high north and south latitudes, and these are connected by lines of magnetic force (being the lines of direction) which, generally speaking, rise out of the earth in one (magnetic) hemisphere, and passing in varied directions over the equatorial regions into the other hemisphere, there enter into the earth to complete the known circuit of power. A free needle shows the presence and direction of these lines. In London they issue from the earth at an angle of about 69° with the horizon (being the dip or inclination), and the plane in which they rise forms an angle of 23° west nearly with true north, giving what is called west declination. When the dip is small, as at the magnetic equator, these lines scarcely rise out of the earth, and pass but a little way above the surface; but where it is large, as in northern or southern latitudes, they rise up at a greater angle, and pass into the distant realms of space, from whence they return again to the earth in the opposite magnetic hemisphere, thus investing the globe with a system of forces like that about an ordinary magnet, which, wherever it passes through the atmosphere, is subject to the changing action of its magnetic oxygen. There is every reason to believe that these lines are *held* in the earth, out of which they arise and by which they are produced, just as the lines which originate in a magnet are held by it, though not in the same degree; and that any disturbance from above affecting them will cause a greater change in their place and direction in the atmosphere and space above than in the earth beneath.

"The system of lines of magnetic force around a magnet or the earth is related by a lateral tension of the whole, analogous in some degree to the lateral tension of lines of static electrical force, both the one and the other being easily made manifest by experiment. The disturbance of the tension in one part is accompanied instantly by a disturbance of the tension in every other part; for as the sum of the external powers of a system, unaltered at its origin, is definite, and cannot be changed, so any alteration either of intensity or direction amongst the lines of force at one place must be accompanied by a corresponding change at every other. So if a mass of soft iron on the east side of a magnet causes a concentration of the lines of force from the magnet on that side, a corresponding expansion or opening out of the lines on the west side must be and is at the same time produced; or if the sun, on rising in the east, renders all the oxygen of the air on that side of the globe less magnetic, and less able therefore to favour the transition of the lines of terrestrial force there, a greater number of them will be determined through the western region; and even though the lines of force may be doubted by some as having a separate existence, such as that above assumed, still no error as to the effects on magnetic needles would in that case be introduced, for they, by experiment, would be and are the same.

"The power of a magnetic body, as iron or oxygen, to favour the transmission of lines of force through it more than other bodies not magnetic, may be expressed by the term conduction. Different bodies, as iron, nickel, oxygen, conduct in various degrees, and not only that, but the same body, as iron or oxygen, conducts in different degrees at different temperatures. When space traversed by uniform lines of magnetic force is occupied by a uniform body as air, the disposition of the lines is not altered; but if a better conducting substance than the air is introduced, so as to occupy parts of the space, the lines are concentrated in it, and drawn from other parts, as shown by P, P in the figure; or



if a worse conducting substance is introduced, the lines are opened out as at D, D. In both cases the lines of force are inflected, and a small magnetic needle standing in them at the inflected part would have its direction changed accordingly. Experimental illustrations of these changes in direction are given in Mr. Faraday's paper in the *Philosophical Transactions* for 1851, part I., par. 2843, &c.

"Now this, by the hypothesis, is assumed to take place in the atmosphere. Supposing it all at mean temperature, the lines of force would have the direction determined by the arrangement of the power within the earth. Then the sun's presence in the east would make all the atmosphere

in that region a worse conductor, and cause it to assume the character of D; and as the sun came up to and passed over the meridian and away to the west, the atmosphere under his influence would bring up changes in direction like those shown in either D or D; it would therefore manifestly set a needle in a given latitude in opposite directions as it passed by; and as evidently set two needles in north and south latitudes, in opposite directions at the same moment of time. As the night came on and a temperature lower than the mean came up from the east and passed over, the lines of force would be inflected as in P or P, and a reverse variation of the needle to that which occurred before, would now take place.

"That natural effects of variation must be produced consequent upon the magnetic nature of oxygen and its daily variations of temperature is manifest; but whether they cause the observed variations, or are competent to do so, is a question that can only be decided after very careful inquiry. Observations are now made on the surface of the earth with extreme care in many places, and these are collated, and the average or mean result, as to direction and intensity of the earth's force, ascertained for every hour and season; and also many remarkable, anomalous and extra results evolved. A theory of the causes of any or all of these variations may be examined first by the *direction* which the varying needle does or ought to assume, and then by the amount of the variation. The hypothesis now brought forward has been compared with the mean daily variation for all the months in the year at north and south stations, as Toronto and Hobart Town, and at many others near to and far from the equator; and agrees in direction with the results observed, far beyond what the author anticipated. Thus the paths described by the upper ends of free needles in the north and south hemispheres should be closed curves with the motions in opposite and certain directions, and so they are:— the curves described by needles in north or south latitudes should be larger in summer and smaller in winter, and so they are; a night, or cold action, should grow up in the winter months, and such is the case:—the northern hemisphere ought to have a certain predominance over the southern, because of its superior temperature, and that is so:—the disposition of land and water ought to have an influence, and there is one in the right direction—so that in the first statement and examination of the hypothesis it appears to be remarkably supported by the facts. All these coincidences are particularly examined into and stated in the *Philosophical Transactions* already referred to. The next step will be to ascertain what is the amount of change in the conducting power of the air for given changes of temperature, and then to apply that in the endeavour to ascertain whether the amount of change to be expected is (as well as the direction) accordant with that which really occurs."

We have extracted the whole of this short paper, for several reasons; for not only does it present an abstract by Faraday himself of his own views on "*Atmospheric Magnetism;*" but also brings before us, in a very striking manner, those peculiar and fanciful notions about "Lines of Force," which we consider so erroneous and absurd; and which form, moreover, so very prominent a feature of the whole of these "Researches." That the above paper is an authorized abstract of Faraday's real opinions, may be concluded from his having reprinted the paper from the "Royal Institution Proceedings" in his own volume—now before us. In fact, the rest of the volume (more than 250 pages) is almost entirely devoted to the enforcing and illustrating and repeating these peculiar views of "Lines of Force." There is indeed scarcely a single page of Faraday's work in which we do not meet with these everlasting "Lines of Force." The reader becomes sick of the very phrase itself: it is repeated over and over and over again—times without number, "usque ad nauseam." It seems to amount almost to a *monomania*. "Lines of Force"—"Lines of Force"—"Lines of Force;" nothing but "Lines of Force!"

In our next article, then, we shall say what we think about these "Lines of Force."

(*To be continued.*)

MICKLE'S IMPROVEMENTS IN PRODUCING IRON FROM THE ORE.

Mr. W. Mickle, colliery agent, of Willington, Durham, has recently patented a mode of economizing the fuel used in smelting or obtaining iron from iron ores. "In smelting or obtaining iron from ores by means of coals in a blast furnace in the ordinary manner," he says, "a large quantity of the combustible matter contained in the fuel escapes unconsumed or imperfectly consumed in a gaseous form, or in smoke, and is thus wasted; and when the coal is previously converted into coke in the usual way, a large quantity of the combustible matter contained in the coal is lost in coking it. In order to prevent this waste (as also with the view of improving the quantity and quality of the iron obtained), I in the first place covert the coal which I intend to employ in smelting or obtaining iron from its

ores into two parts, that is to say, ordinary coal gas and the coke usually called gas coke, and I then use those combustible elements or products of the coal in the blast furnace as fuel, for the purpose of producing the heat necessary for smelting or obtaining the iron."

For this purpose, the ordinary or any other convenient mode of producing gas and coke by the dry distillation of coals in retorts may be employed; and as the gas is not intended to be burnt for the purpose of illumination, the coal may be of an inferior and therefore cheaper description than that usually employed for that purpose. The coke obtained is introduced into the blast furnace, together with the iron ore, in the ordinary manner; but a smaller quantity of coke is requisite when gas is also used, according to this invention, than when coke alone is used as fuel in the ordinary manner. The coke obtained from any quantity of coal, as above mentioned, when the coke is used as fuel in a blast furnace together with the gas obtained from the same quantity of coal, will, the inventor believes, be found to be more than sufficient to produce the heat requisite for smelting the same quantity of ore as might have been smelted by the combustion of the coal itself; and by using coke instead of coal, the production of smoke is avoided or greatly diminished.

The gas may be purified, when necessary, in the ordinary or any other convenient manner. When the coal contains sulphur, the gas should, as much as possible, be freed from that and every other material injurious to iron. The gas may be collected and stored in an ordinary gasometer, or any other convenient receptacle, whence it can be drawn or taken with facility, for the purpose of being introduced into the furnace or furnaces in which it is to be used. The gas obtained in this manner is infused, blown, or injected into the furnace through pipes or tuyeres, either through separate pipes or tuyeres, or through the same pipes or tuyeres as the ordinary blast of air, or through pipes within the ordinary air pipes, or in any other way which may be found convenient. If the gas pipes be placed within the air pipes or tuyeres, they may be inserted at or near the furnace through an inlet and joint pipe of the air pipes; and in such cases, if necessary, a little more pressure can be applied to force in the requisite quantity of air. The blast pipes and tuyeres may either be placed so as to inject or introduce and direct the gas in the same manner and way as the ordinary hot or cold air blast is introduced into the interior of the furnace, or so as to direct the blasts of air and gas to a point within the furnace, or in any other manner which may be deemed most effective.

The apparatus employed for blowing the gas into a blast furnace may be of the same description as apparatus used for blowing air into such a furnace. To keep up regularity of the gas blast, a chamber may be placed between the pumping apparatus and the furnace, and connected with pipes leading to both; or the size of the gas pipes may be arranged to maintain the required regularity; safety valves can be attached to the chamber or pipes, if desired.

Mr. Mickle deems it necessary to regulate the quantity of gas blown into a furnace, as above described, in order to prevent the production of too high a temperature, which might destroy the furnace, or be otherwise injurious, and also for the purpose of preventing any excessive or undesirable consumption of the gas. For this purpose he varies the speed of the blowing apparatus used for injecting the gas from time to time, as may be necessary, so as to regulate the supply of gas to the furnace, and also the heat produced by its combustion within the furnace; or the same effect may be produced by means of taps or valves introduced into the gas apparatus pipes, the outlets being more or less opened or closed from time to time, according to the quantity of gas desired to be used.

In order to prevent any accident occurring from the production of an explosive mixture of gas and air within the gas apparatus, by reason of the forcing of air into the gas pipes, either by the pressure of the air blast within the furnace, or otherwise, he prefers to furnish the gas pipes or apparatus with a valve, which will permit the gas to pass only in the direction of the furnace, and prevent the introduction of air into the gas pipes or apparatus. If a very high heat should be required for some particular purpose, both the gas and the air blast, or either of them, may be heated in the ordinary or in any other convenient manner. In practice, Mr. Mickle prefers to use furnaces, the throats of which are not small or contracted, so that there may be more room for the expansion of the gas.

When peat is intended to be used, it may in like manner be subjected to a process of dry distillation, and the solid and combustible gaseous products of the distillation used in the same way as was mentioned with respect to the coke and gas obtained by the distillation of coal. So also wood, or other fuel yielding upon distillation both solid and gaseous combustible products economically and in sufficient quantity, may be subjected to dry distillation, and the solid and gaseous products used as before described.

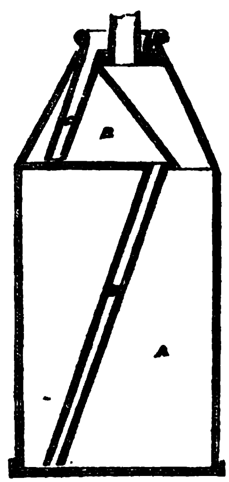
In noticing this invention, the *Mining Journal* says, "The effect to the ironmaster

practically, we conceive, will be this—that he will obtain as much metal of superior character, at less charge for fuel, from one furnace, as he now can from three or four, and at no increase of cost in any shape, except labour. The present capital for an establishment, therefore, which admits a supply of three to four millions, will then, with the same facility, yield ten to sixteen."

DRAPER'S IMPROVED OIL-CAN.

MESSRS. E. D. and G. DRAPER have patented an improved can or vessel for oiling machinery, of which the following is a description.

In the accompanying engraving, A is an oil-can or vessel, provided at its upper part with a long discharge tube C, which is surrounded at or near its lower end with a trough *b*. Within the vessel A, and near its upper part, is a close vessel B. A pipe



c leads out of the trough *b* and into the vessel or chamber B, and terminates and opens near the bottom of the vessel B. Another pipe D leads out of the bottom, of the chamber B, and opens into the oil reservoir A near its bottom, and is inclined towards the side of the vessel.

When the vessel A is supplied with oil or other liquid and is inverted, such oil or liquid will flow through the pipe C and out of it, and such oil or liquid as may run down on the outer surface of the tube *c*, when it is restored to an upright position, will find its way into the trough *b*; from thence it will flow down the pipe *c* into the chamber B, and from thence into and through the pipe D and into the reservoir A. When the oil in the vessel A does not reach the bottom of the chamber B, and we invert the oil vessel, no oil can escape from the chamber B into the pipe *c*; but such oil as may be in the chamber B will remain in it. By means of the pipe D, the chamber B, and pipe *c*, the air, when the can is inverted, passes into the reservoir A, so as to permit the oil to freely flow out of the pipe C without material obstruction from the pressure of the atmosphere. The capacity of the tube D should be less than that of the chamber B. On supplying the oil can with oil, the fluid should not be allowed to rise in the chamber A above the level of the bottom of the chamber B.

KIND'S SYSTEM OF MINE-BORING.

MR. KIND, whose system of boring was described and illustrated in the *Mechanics' Magazine* of December 9, 1854, has recently been busily engaged in boring a new Artesian well in the Avenue Charles X., at the angle of the Avenues St. Cloud and Petit Parc, near Paris, for the purpose of supplying the ornamental lakes of the Bois de Boulogne. A paper has been communicated to the Académie by M. Dumas on the subject, from which it appears that Mr. Kind has undertaken to bore a well 29 inches in diameter, and continue the sinking, if necessary, to the depth of 2,500 feet, and thus obtain a daily supply of 10,000 cubic meters of water, being nearly equal to the volume of water delivered by the Seine through the Pont de la Tournelle, at Paris. The boring was commenced on August 2nd last, with a diameter of about 41 inches. For some time, when the operations were through marl and chalk, the average daily progress was 16½ feet; then, through sand, it was reduced to 8½ to 10 feet; and now, having reached another stratum of chalk, containing boulders, the speed is 5 feet, the depth being already upwards of 980 feet. By May 1st it is expected that the enormous depth of 2,360 feet from surface will be attained, being more than 490 feet deeper than the Artesian well at Grenelle. The sole motive power is a steam engine of 24-horse power.

DIDIER'S IMPROVED RAILWAY BREAKS.

M. DIDIER, of Voiron, France, has recently patented, in this country, a peculiar construction and arrangement of railway breaks, whereby the train may be stopped without skidding the wheels, thus preventing the great wear and tear of tyres una-

voidable in the ordinary arrangements of railway breaks. According to this invention, the breaks themselves consist of skids or sledges of hard wood, let into suitable cast-iron frames or sockets, which are bolted to the carriage framing. The ends of the ordinary suspension springs are connected by links to short levers fast on the ends of transverse shafts, placed below the carriages. These shafts are each fitted with a lever arm in connection with rods worked by a horizontal lever, which works on a fixed fulcrum in the centre of the framing. Another rod, connected with the end of the horizontal lever by a nut and screw, having a large pitch, serves to bring the break out of action when deemed desirable. This shaft is prevented from turning by means of a suitable forked key or detent, fitting on to a square or flat portion of the shaft. When this key is raised or removed to bring the breaks into action, the weight of the carriage turns over the levers connected with the carriage springs, and thus allows the entire carriage with its load to descend until the skids or sledges are brought in contact with the rail or rails, thereby speedily stopping the train. The carriage is raised by turning the screwed shaft with a winch handle, and thereby bringing the rods and levers into their original position again. The break mechanism of the several carriages of a train may of course be connected, if found desirable, by suitable coupling, so that the whole of the skids may be applied simultaneously.

THE SMOKE QUESTION.

AWARD OF THE SOCIETY OF ARTS' PRIZE.

The official prize of £25, or a gold medal of that value, offered by the Society of Arts (out of a sum placed at the disposal of the Council for Premiums, by B. Oliveira, Esq. M.P.) for the best Essay "On the Means of Preventing the Nuisance of Smoke arising from Fires and Furnaces," has been awarded to our esteemed correspondent, Mr. Charles Wye Williams. We are much gratified to find that the Council have been judicious enough to select for honour, the production of a gentleman who is better qualified than any other writer to announce the results, both of theory and practice, in regard to the smoke question.

EXHIBITION OF INVENTIONS AT THE SOCIETY OF ARTS.

The eighth annual Exhibition of Inventions, in connection with the Society of Arts, &c., is now open at the Society's house John-street, Adelphi, and from the peculiarly useful character of most of the objects exhibited will well repay the visits of those who are interested in scientific inventions. As a necessary consequence of our practice of giving short descriptions weekly of all patented inventions, and illustrated descriptions of the most striking among them, it happens that in exhibitions of this kind there are but few things with which our readers are not already acquainted. Nevertheless, as a better understanding of an invention may frequently be obtained from the inspection of a model than from that of an engraving and written description, and as many of the articles exhibited are models, the exhibition is of important service, even to our own readers. Such of the inventions exhibited as have not yet been brought to their notice will be laid before them from time to time.

ON THE PROSPECTS OF STEAM CULTURE.

To the Editor of the Mechanics' Magazine.

Sir,—In the rapid progress of mechanical improvements which has so remarkably distinguished the last half century, its application to agriculture, although the latest, is not the least remarkable.

Mr. Fairbairn, in his "Useful Information for Engineers," observes:—"It is nearly half a century since I first became acquainted with the engineering profession, and at that time the greater part of our mechanical operations were done by hand. On my first entrance into Manchester, there were no self-acting tools; and the whole stock of our engineering or machine establishment might be summed up in a few ill-constructed lathes, and a few drills and boring machines of rude construction." At this period, too, the agricultural implements of England comprised little more than the plough and harrow; and those, for the most part, of a very rude and primitive construction. But now, not only have these articles been made the subjects of numerous improvements, increasing their powers and extending their usefulness, but to them have been added scarifiers, clod-crushers, drills, hay-making, reaping, and thrashing-machines—driven by manual labour, horse-power, or by steam.

Several notable attempts have at various times been made to plough by steam, but hitherto with little practical advantage. The schemes proposed for this purpose have been of two distinct kinds, viz., locomotive steam engines with revolving cultivators

attached, or portable steam engines acting by means of ropes and windlasses upon ploughs of the ordinary or peculiar construction. The latter class of instruments have hitherto been the favourites, but, as I think, erroneously; my firm conviction being that, whenever that triumph of agricultural engineering, steam-ploughing, is accomplished, it will be by direct-acting engines with cultivators attached. At a recent meeting of the Society of Arts, Mr. A. Ransome expressed his opinion that "the experiment is too great for any one individual—too large for private enterprise." It is quite true that the experiment is a costly one, but still it is one from which talented and enterprising manufacturers do not shrink, and more than one party is at this time engaged in its prosecution. In a paper on "The Progress of English Agriculture during the last Fifteen Years," read before the Society of Arts, by Mr. C. W. Hoskyns, after enumerating and explaining many of the great improvements in farming and agricultural implements, that gentleman proceeded to observe that "every improvement, with the exception of the clod-crusher, was addressed to light land culture. If the farmer of the clays had but an implement that would work night and day during those critical six weeks of September and October, after his grain was harvested, and before the November fogs and rains set in, he would indeed be beholden to mechanical skill; but the want of this left him often overtaken by the approach of winter, with many a task unfinished, that came with redoubled pressure upon the hurried days of spring time. He believed this mechanical difficulty could be overcome, and that it was worth the effort, not only of a company, but of a nation. With its accomplishment, England might add one-fourth to its wheat crop."

It is by no means improbable that this desirable object may be accomplished by the next annual public meeting of the Royal Agricultural Society of England. Mr. Hart, of Wantage, having designed and patented some improvements in the application of steam to agriculture which promise to surmount the difficulties that have beset the path of the earlier labourers in this vast field of enterprise.

The combined thrashing and dressing machine, exhibited by Mr. Hart, at the cattle show in Baker-street, in December last, attracted a large share of attention, and was greatly admired. When driven by a portable steam engine and duly fed with corn, this machine thrashes out the grain and separates the products, which are delivered at distinct and separate parts of the machine; the straw, cavings, and chaff each going to its proper place, while the grain is thoroughly dressed and separated into two (or more) qualities, which are delivered into sacks attached to the spouts of the machine, ready for market. The perfect action, and extraordinary results of this machine gave great satisfaction, and it was extensively patronized. Should Mr. Hart's present attempt at steam culture prove equal to his anticipations, we may ere long see a large field ploughed, sown, harrowed and rolled, at one operation in the course of a few hours, without the intervention of any other manual labour than the engine-driver. In due time, the elements having done their part, and the corn being ripe, by means of a reaping-machine the contents of the field may be quickly garnered; Mr. Hart's thrashing and dressing machine will then take up the finishing process, and the wheat may find its way to market, a product of the most ingenious combination of mechanism which has ever emanated from the mind of man, and susceptible of comparatively little further improvements, until some persons should be fortunate enough to discover a lighter and cheaper power than steam.

I am, Sir, yours, &c.,

WM. BADDELEY.

13, Angell-terrace, Islington,
March 13, 1856.

THE VOLTAIC BATTERY AND BLASTING.

To the Editor of the Mechanics' Magazine.

SIR,—Doubtless, you will have observed the statements of Sir De Lacy Evans on the Government foresight and arrangements as to telegraphic communications with the Crimea; as also, more recently, as a sort of corollary, the remarks of the Commander-in-Chief, General Codrington, in one of his late despatches, on the subject of blowing up the docks at Sebastopol—"The voltaic battery," he says, "we must confess did not always succeed; it seems to require great nicety in preparation; but in these cases in which I saw it succeed, the effect was perfect!" The enclosure from Lieut.-Colonel Lyod, commanding Royal Engineers, is still more evident, like most else in the Crimea, that the right man is not always in the right place. After recording *his* indebtedness to sundry lookers-on, he states that, "I was extremely anxious that the facilities afforded by her Majesty's Government for the employment of voltaic batteries on a large scale, as sent out by the Admiralty under Mr. Deane, should be fairly tested under the most favourable circumstances . . . and this gentleman had every assistance in skilled labour afforded him from the Royal Sappers and Miners. Many failures having

taken place in firing the charges of electricity, owing to different causes, *I* am inclined to *doubt* its advantages as applicable generally to military purposes!!" Poor man! how easily he seems to have been imposed upon; but no wonder, it being pretty evident from his own showing, that he himself knew little about the matter. Those versant with the subject may well blush for their country's credit on reading the above. It only shows, although John Bull patiently and perseveringly pays his taxes, what rapid progress our Royal Engineers have made in voltaic blasting, since the encampment at Chobham; when, as you may remember, to show what could be done by electricity, and to astonish the natives, a fort was to have been blown up—nay, further, her Majesty was to connect the wires; when, lo! after the breathless expectation of the troops and bystanders, kept at a respectful distance to be out of danger, there was no result, and Majesty thus made to look ridiculous by the excessively well-arranged theatrical entertainment of the War Department; at the same time showing the Czar, and all else whom it might concern, how little they had to fear from such ignorance and bungling; and yet it is not to be wondered at when we see the dicta of the powers that be, as to men being required to know, by intuition, as it were, the whole subject and practice of electro-dynamics.

Voltaic blasting, besides being certain in its effects, has many other advantages; as ten, twenty, or thirty mines can be fired instantaneously, with the same certainty as one; and with but common-place astuteness in the practice of such electrical operations. See the late accounts of the blasting and its effects at Holyhead, as also the report, some years ago, to the Woods and Forests on the blasting operations in the formation of the Queen's Drive round Arthur's Seat, near Edinburgh.

I am, Sir, yours, &c.,

GALVANISM.

London, March, 1856.

CHATTAWAY'S BUFFING AND COUPLING APPARATUS.

To the Editor of the Mechanics' Magazine.

SIR,—In answer to Mr. Chattaway's letter, which appeared in your last number, I beg leave to say that my attention was particularly called to a mode of buffing and coupling, fitted to an American railroad car, by a friend of mine pointing it out to me, and remarking, that it was a "Yankee dodge" for getting the most out of one spring. I did not pay much attention to the plan at that time, but of this I am quite certain, that *one rod* and *one spring* served both for draw bar and buffer rod. Though I believe this plan is used generally in the Southern States, the only place I remarked it was at the depôt for cars, in Richmond, Virginia, United States. Perhaps a line to the *Scientific American* would elicit the truth of what I assert.

I am, Sir, yours, &c.,

AMERICANUS.

MECHANICAL LOCOMOTION.

To the Editor of the Mechanics' Magazine.

SIR,—I am made to say, in No. 1701, of my calculation of the operation of the forces in an engine, "which is a rigidly correct application of the laws of science." This is a misprint; I wrote, "and that it is," which is much less positive when taken with the preceding, "I believe."*

The letters of your correspondents in last week's Magazine, who have taken up the subject of my communication, are remarkably characteristic of the several writers (except that I am not well acquainted with Mr. Truran's compositions), and they furnish overwhelming proof that confusion, contradiction, and uncertainty are the rule, and not the exception, in this department of science. One after another declares the matter to be a very simple one, and at once proceeds to contradict the views of his forerunner, and is followed by a third equally at variance with No. 2; yet, almost without exception, they are evidently men of intelligence and talents, and practised writers on scientific subjects. Each conceives himself to be well able to set the matter at rest, and writes as if he could, of course, dispose of the whole affair at once, if he did but enter fully into it; while the more this is done, the greater is the confusion, and the more irreconcilable the contradiction, varied here and there by a few well-meant thrusts aimed at myself, and some sharper ones for Mr. Cheverton. In surveying such a state of things as this, I cannot but be confirmed in what I well knew before, from private experience, to be a true opinion; namely, that the men best informed on this subject disagree point blank with each other, and give the most conflicting solutions to simple problems connected with it; sometimes predicting motion when none takes place, and a dead lock when the result is contrary (this I have many times

* The mistake was our correspondent's own, as he omitted the conjunction and pronoun in his MS. (which we have before us), and thus conveyed a wrong meaning. His MS. runs thus:—"I believe no fallacy can be detected in this calculation, that is a rigidly correct," &c.—ED. M. M.

found), besides entertaining such a variety and complication of notions and calculations to make their several conceptions harmonize at all with the facts of experience, as recalls the cycles and epicycles, &c., of the Ptolemaic astronomers to mind, and satisfies me thoroughly that there could be no such maze of contradiction among such men as these upon so simple a matter, if their ideas were not vitiated by the prevalence of some fundamental error. I believe that an error of this kind does exist, and that it consists of omitting to consider the reaction as well as the action of the force employed. It is a remarkable fact that not one of the gentlemen who have criticised the theory which I have propounded have even attempted to point out an error in the calculation of the action and effect of the forces of the action and reaction of the pressure of the steam in the cylinder which constitutes it. Those pressures are not denied to exist, and we shall, I apprehend, in vain attempt to understand the operation of the machine while we confine our attention to that alone which acts on the face of the piston. Knowing the not uncommon tendency to let slip the main question, and confuse oneself with lateral questions, I purposely directed attention to the real point of the matter, as I conceive it, which is this:—Here is a calculation of the simplest kind as to the effect of a pressure of 1,000 lbs. on the front end of the cylinder when opposed by a similar pressure on the face of the piston, (for that is the precise state of the matter;) if the piston were fixed in the cylinder, of course a dead lock must result; but it is not fixed, it transmits its power to the middle of the spoke of the wheel right under the axle, and be the fulcrum of that spoke at the rail or at the axle, the plainest rules of leverage demonstrate that it can only press against the axle with a force of 500 lbs., and therefore must leave the 1,000 lbs. of reactive pressure in the contrary direction at the end of the cylinder, propulsive forward, to the extent of the balance of 500 lbs.; and all the while the piston (is below the centre, *the propelling power* impelling the engine, and of course drawing the wheels onward too. Now, is this calculation accurate, or not? That, I conceive, is the point to be attended to in my letter; but all have shot beside the mark, and appear to scarcely perceive that in this calculation the propulsion is supposed to be effected *in the cylinder, and by the reaction,* while the piston is below the centre, instead of by "tractive force in the rim of the wheel," a difference of vast importance, though "J. C." says that there is nothing essentially different from the ordinary solution in my theory; while the fact is, that I maintain that the common theory does not indicate correctly, or in fact at all, the point at which the propulsive impulse is communicated to the mass of the engine. If any gentleman can *point out an error* in the tracing of the courses and effects of these two pressures, he will enlighten my mind considerably, and have hit the nail precisely on the head, which I do not perceive an attempt at in the five letters in last week's Magazine.

Perhaps some one may deny that the principle of action and reaction operates in locomotive machines, though I do not perceive any symptom of that at present; but should there be any, I would call attention to the fact, that if the pressure on the spoke were communicated by a man, or a piston, whose reaction was not in the machine, it would move backwards, and not forwards, and with a power of 500 lbs., and on the man, or cylinder, being attached to, and resting on the machine, it would immediately reverse its course and move forwards with precisely the amount of the balance power that the reaction would have over the action, if the latter were applied through a third order lever; while, if the man stood in the machine and pushed against the ground, it would advance in the direction of the reaction through his body with just the entire power of the reaction. Many other experiments—the horse one in our last letter for instance—might be adduced, which prove this point conclusively, but directly it is admitted that action and reaction are to be accounted for and taken into consideration in locomotive machines, it becomes necessary to give full weight to the 1,000 lbs. pressure at the end of the cylinder. I do not now enter upon the case of when the crank is above the centre, nor upon that of vertical cylinder engines, from considerations of time and space, and because the first selected instance is the plainest, and I think sufficient. The explanation which I have given readily accounts for the reaction, but I do not see how any other view of the matter can; and it also furnishes a clear exposition of how the engine is moved, while the common theory does not attempt to do that all-important thing, never tracking the motive force further than the rim of the wheel, *nor showing how it reaches the mass of the engine at all,* which it ought to do before it is called a complete explanation. I should like to know how the "tractive force in the rim of the wheel" gets up into the engine from the "adhesion," "rail," or "friction," at which we are told to look for it; it is not the rail, but the mass of the engine which requires to have an impelling power applied to it, and the common theory leaves us without any

means of understanding how this is effected.

I will now give my explanation of the motion of a boat, because I think that it will be auxiliary to the main question, and because the disquistion of "W." upon that matter appears to me unnecessarily complicated, and quite insufficient. I consider that when a rower pulls the handle of an oar with a force of 50 lbs., he necessarily causes a reactive pressure to enter the mass of the boat in a contrary direction through his body, which any one may fully satisfy himself of in the space of a minute's trial; and consequently there can be no propulsion contrary to this force until a greater power opposes it; that power is furnished by the pressure on the rowlocks, arising from the water giving to the oar a fulcrum, and so enabling it to press against the rowlock with a power augmented accordingly, the oar becoming a lever of the second order, and so pressing against the rowlock with a force exceeding 50 lbs.; if the length of the traverse of the boat be taken, and its force of movement multiplied by it, it will be found to be exactly equal to, and is in fact a reproduction of, the force of 50 lbs. applied to the handle multiplied by the distance through which the handle is moved by the man. The case of the boat I consider to be parallel to the locomotive, with the crank above the centre, and the adhesion for the fulcrum of the spoke, which is then acting as a lever of the second order against the reaction at the back end of the cylinder, and as in the boat, overcoming it by the leverage; there being no adhesion and no complicated machinery to suggest difficulties in this boat illustration, it is of very easy perception. Those who are well acquainted with the history of the "locomotive," will remember the surprising errors respecting it which time has exploded. It used to be said that the friction was the same at different speeds! and at first it was declared that the adhesion would give so slight a fulcrum that nothing but slipping round of the wheels would take place! Yet clever men of science held these views.

I believe that in solving the problem of "how is a locomotive engine propelled" (which is by no means the same thing as "how are its wheels turned round,") we have no need of any complicated theory or of supposititious forces in the fulcrum, or friction, or other forceless things, but have only to take the common general laws of motion and leverage, and apply them simply to the forces which are impressed on the machine. Without overstepping these limits, we shall be able to explain the whole matter so easily, so exactly, and so entirely in accordance with every result, that no other materials than these facts and laws will be at all required in framing our hypothesis of the matter,—they would be in fact an incumbrance; and when I find myself able to explain entirely all the operations of the machine, without introducing any of the dubious suppositions and complications which are prevalent, I am strongly disinclined to adopt them, especially when I see how "the doctors differ," and contradict each other right and left so flatly, that it is plain there must be a great deal of error amongst them.

I think that it might have been better if "W.," after stating that he was utterly unable to comprehend my explanation, had postponed declaring it to be as faulty as the confusion of ideas which it is intended to remove until he did understand it.

The idea of Mr. Cheverton respecting the term "fulcrum" being used for "abutment" had previously occurred to me; but I think no evil arises from it, for at last they are both nothing more than resistances which enable force to be developed. A fulcrum is the abutment of a lever; without it no lever can act; and the same is true of any force. It must have a foundation, or something to press against, which is to it just what the fulcrum is to the lever. I do not attach any extraordinary property to a fulcrum, as "W." supposes; and I cannot agree to his doctrine that a fulcrum is always "permanently fixed." In his own illustration of the oar we have a shifting fulcrum in the water; the air affords a similar one to the wings of birds; and a horizontal spring, although receding before great pressure, would yet, while so receding, afford a considerable fulcrum; so would a perpendicular one with a lever turning on it, and a great rolling stone would afford a fulcrum to a horizontal lever applied more rapidly than the stone was moving.

"J. C." appears to dislike Mr. Cheverton and myself asserting that confusion of ideas on the present subject existed amongst the writers on the projectile controversy. I cannot see why we should not say so, when the thing is plain, and it is further proved by the letters now under discussion; neither am I aware that we assumed for ourselves the exclusive excellence which he implies we arrogated; and how singular it is to see "J. C.," in his next paragraph, forget his own doctrine, assume that I do not give "careful and unbiassed attention to the subject," though, I believe I do, and set me down as a beginner (which I am not), without correct notions of mechanics or mechanical laws. If "J. C." were to declare that an apple falls to the ground, by the attraction of gravitation, I should say, "You

have explained that by an hypothesis which is built upon an admitted law and fact, and have not resorted to supposition or unproved assumption." This is the meaning of the sentence which "J. C." criticises; it is but an hypothesis to declare, that twice two will make four, but it is based on such well proved laws, that it might be fairly declared independent of supposition, unless we introduce metaphysics into the argument, and bear in mind that all human knowledge is at best but uncertainty. If "J. C." is right in declaring my theory to be as old as the hills, it is strange that it should be so novel to Mr. Cheverton and "W.," and I have before pointed out an essential diversity between it and "the ordinary solution." Though, on these points, I differ from "J. C.," I must, of course, agree with him entirely respecting the position of the fulcrum, and should be glad to find less difference between us on other points.

Mr. Cheverton, as I anticipated, thoughtfully endeavours to throw light on the subject. I have already referred to his idea respecting the use of the term "fulcrum," and my remarks respecting the propelling of a carriage by means of a pole will apply to what he says on that point. In the case of the pole slipping, I should say that there was no fulcrum at all, nor any power developed, in consequence of the slipping. If my remarks about the propulsion of boats do not explain my views enough to him, I shall be happy to say more about "paddle-wheel steamers." If he will examine my letter again, he will perceive that I do not consider the reaction to involve a loss of half the power; to traverse "twice the length at half the power," is not to lose power.

"J. Truran" has not rightly understood my theory; if he had he would not have advanced the argument marked, "1st." I hope this letter will make it clear to him. His "2nd" argument I have already treated in replying to "W.," and will here add that, not only may a receding body be used as a fulcrum for any of the three orders of lever, but that an advancing one may be similarly employed, and in that way the successional fulcrum afforded by the adhesion is quite sufficient to supply a continuous abutment to the force at work in the engine, as appears to be Mr. Recordon's idea, with whom, and with "J. H.," of Chester, I partially agree.

I hope that, in treating of this subject, the gentlemen who have taken a part will actually make the calculations which I suggest, and, try the experiments alluded to, dismissing for a moment their preconceived ideas, except those common laws of science which all admit, and then they possibly may not require to take them up again. I have tried to reconcile the common theory with facts in this manner, but find it to be impossible; and am unavoidably obliged to put confidence in the more simple yet sufficient explanation which I have proposed, in which I do not venture beyond the boundaries of the well-proved laws of science.

I am, Sir, yours, &c.,

C.

April 1, 1856.

To the Editor of the Mechanics' Magazine.

SIR,—Seeing, by the continued correspondence on mechanical locomotion, in your last number, that your correspondents cling to the use of the term fulcrum, I am induced to trouble you with a very few more words on the subject.

The word *fulcrum* means strictly a prop or support, and was originally employed to designate the external support applied to a lever. In the original idea of the word, the external support so supplied was always by the agency of a fixed obstacle. The word has never found much favour amongst mechanical philosophers, who have confined its application almost exclusively to the lever.

Instead, therefore, of introducing a new definition and a new idea of the term fulcrum, not very reconcilable with historical notions, as proposed by Mr. Recordon, the best thing we can do is to discard its use altogether, except in those cases in which it properly applies.

With regard to a locomotive machine, it is far better to do, as mechanical philosophers have invariably done, namely, confine ourselves to the ideas of those forces which are employed to produce motion, and those forces which Nature opposes to motion; in other words, to the moving forces and the resistances; and when we come to the case of uniform motion, under such conditions, we shall find the simplification of ideas, thus insured, very advantageous to the right conception and subsequent solution of the problem.

Thus in the locomotive railway engine, and generally in all engines which work by a driving wheel, the moving force is applied to produce motion round the axle, and a simple investigation shows that the work developed on the piston is equal to the work done in driving the wheel round. This rotatory motion of the wheel is opposed by the friction of the rail; and when there is uniform motion, the work done by the friction must be equal to the work done by the crank in driving the wheel round (at present putting the friction of the parts of the machine itself out of the question).

This is at once a simple and sound mode of viewing the case; and I think much advantage would be obtained by practical mechanicians taking this view.

I venture to repeat my opinion, that attempts to discover fulcrums and levers of first, second, or third orders in such cases only tends to confuse.

Thus in the action of the crank attached to the driving wheel of the locomotive, I cannot recognize any such change as "C." seems to imagine from a leverage of advantage to a leverage of disadvantage. There are, of course, *dead* points, when the moving force produces no result, over which the momentum of the wheel carries it, and again brings it into a position in which the moving force acts.

But in the half stroke during which the force applied by means of the crank is a *pushing* force, and in the other half in which it is a *pulling* force, the effects of the force are of the same kind; viz., to produce motion round the axle in the *same direction*, and undergo the same variations from the dead point to maximum, and so to dead point again. What I would strongly recommend is, that in accordance with the practice of the cultivators of the science of mechanics, the term fulcrum should be entirely abondoned, as being inapplicable, useless, and tending to cast obscurity, rather than illumination, on the case.

I am, Sir, yours, &c.,

"W."

London, March 29, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BERGH, C. V. *An improvement in the mode of packing pistons of steam and other engines.* Patent dated August 22, 1855. (No. 1898.)

The inventor describes certain bronze or other metal packing rings so formed that, when placed in alternate pairs, as one end expands the next contracts.

LOWNDS, J. J. *An improved extension pen and pencil-case.* Patent dated August 22, 1855. (No. 1901.)

This invention consists of a peculiar construction and arrangement of the pen and pencil tubes and slides whereby the case may be lengthened when in use, and shortened when out of use.

ZINKERNAGEL, J. T. A. *Improvements in the manufacture of mosaic work.* Patent dated August 23, 1855. (No. 1903.)

This invention consists in arranging the materials of the mosaic work so that several duplicate pieces are cut simultaneously, in order that several copies may be prepared together.

WYCHE, T. E. *Improvements in propelling vessels.* Patent dated August 23, 1855. (No. 1904.)

This invention consists in dividing the screw propeller blade into two equal parts from the boss outwards, and in placing one-half to the right and the other to the left of the line of the boss on which the base of the blade is ordinarily set, thus leaving space for the water to pass through.

JONES, W. *Improvements in machinery or apparatus for printing woven fabrics and paper hangings.* Patent dated August 23, 1855. (No. 1905.)

This invention consists in making the colour rollers of "surface printing machines" of air-tight flexible materials, and filling them with compressed gas, or liquid, thus obtaining an elasticity which renders the endless cloth unnecessary. Also, in forming the edge of the "doctor" with projecting parts, formed on bars or blades, or rollers.

CLAUS, C. *Improvements in removing hairs from hides and skins.* Patent dated August 23, 1855. (No. 1906.)

This invention consists first in producing certain substances, and next in applying them. 1. Carbonate of lime, or caustic lime, is fluxed with sulphur. 2. Pyrites is fluxed with carbonate of lime, or caustic lime. 3. Sulphate of lime in gypsum, at a red heat, is reduced with carbonaceous matters, as coal or coke, thus losing its oxygen. The substances thus obtained are either lixiviated with hot water repeatedly, or are allowed, after being reduced to a coarse powder, to lie in large heaps, and exposed to air and water in the form of rain. A partial decomposition ensues, and the products are washed out by the stream of water; the liquid thus obtained is collected in tanks, and used for unhairing hides and skins.

FOUCHIER, V. *Improvements in constructing and preparing mill-stones.* Patent dated August 23, 1855. (No. 1907.)

In order to divide the grain instead of crushing it, and to prevent the lumping and heating of the flour by causing cold air to circulate between the stones, the inventor adopts a peculiar method of channelling the millstones, and employs different kinds of stones in the construction of a pair of mill-stones.

MARTIEN, J. G. *Improvements in preparing certain oxides of iron for use, and for apparatus to be used therein.* Patent dated August 23, 1855. (No. 1909.)

These improvements consist in purifying certain oxides before using them in the manufacture of iron, by first subjecting them to

heat in a reverberatory or other furnace, and then subjecting them to the action of streams of air forced into the mass by a blowing apparatus, and also to streams of steam, or of water. The invention also comprises improvements in the apparatus used in the above process.

DENTON, W. *Improvements in drawing wool and other fibrous substances off the combs of combing-machines.* Patent dated August 23, 1855. (No. 1910.)

This invention consists in placing the drawing rollers parallel, or nearly parallel to the comb, and in tapering the ends of the rollers; the wool enters between them at their tapered ends, and the longer and shorter wool are both taken hold of close up to the comb, and drawn off together.

THOMAS, W. L. *Improvement in projectiles.* Patent dated August 23, 1855. (No. 1911.)

This invention consists in forming elongated shot and shell in such manner as to cause them to expand, while being fired, around the upper as well as the bottom or lower parts thereof.

KIDMAN, W. *An improvement in tillers or yokes.* Patent dated August 23, 1855. (No. 1912.)

This invention consists in making the standing part of the steering rope or chain fast to the tiller or yoke, the rope or chain being then led through side sheaves or blocks to single or double sheaves or blocks in the tiller or yoke, and then through other single or double side sheaves or blocks to the barrel of the steering wheel.

BARTLETT, T. *Improvements in machinery for drilling or boring into stone.* Patent dated August 23, 1855. (No. 1913.)

This invention is described on page 294 of our last number.

ARCHER, F. S. *Certain improvements in photography.* Patent dated August 24, 1855. (No. 1914.)

A description of this invention will shortly be given.

WOOD, W. *Improvements in the manufacture of pile and other fabrics.* Patent dated August 24, 1855. (No. 1915.)

This invention consists in brushing and smoothing mohair and other pile warps or yarns used in weaving pile fabrics, and in the application of moisture to the yarns at or near the points where the cloth is produced, when weaving velvet and other pile fabrics; also, the application of heat to the water used for the last-mentioned purpose; also, in the employment of steam for that purpose. It consists further in using in the pile warps of piled fabrics single spun threads of mohair, worsted, or cotton, instead of double threads, and in raising up only one-half of the pile or warp threads at a time to form a row of loops, when weaving silk, worsted, or cotton velvet, or cut pile carpeting, &c.

DE LA RUE, T. *An improvement in printing inks.* Patent dated August 24, 1855. (No. 1918.)

This invention consists in employing borate of magnesia to improve the printing and drying properties of printing ink.

SCHLICKEYSEN, C. *Improvements in machinery for manufacturing pipes, bricks, and tiles.* Patent dated August 24, 1855. (No. 1921.)

This invention relates to an arrangement of apparatus on the pug-mill principle, and to a modification of this apparatus to be applied to the washing of earths.

AVERY, J. *Improvements in handles for augers, gimlets, and other tools, and instruments to which such handles may be applicable.* (A communication.) Patent dated August 25, 1855. (No. 1922.)

This invention relates to the employment within such handles of a double ratchet movement and reversing gear for the same, so that the tool may be rotated in either direction by twisting the handle backward and forward in an arc of a circle.

AVERY, J. *Certain new and useful apparatus for exhausting and closing vessels.* (A communication.) Patent dated August 25, 1855. (No. 1923.)

The principal parts of this apparatus are an exhausting pump without valves, and certain devices for holding the stopper during the exhausting process.

AVERY, J. *Automatic attachments to be applied to gates and doors.* (A communication.) Patent dated August 25, 1855. (No. 1924.)

The patentee describes an apparatus by which a gate or door may be opened or closed by merely working a lever at either end of it.

AVERY, J. *Improvements in sewing machines.* (A communication.) Patent dated August 25, 1855. (No. 1925.)

This invention consists in feeding the material to be sewn by means of a feed-plate guided by grooves in which pins work, so as to make the material to describe a given line in passing the needle, and in combining the guide pins with a shoe which confines the feed-plate, and produces the required pressure upon the material.

BROWN, W. *Improvements in the manufacture of paper bags.* Patent dated August 25, 1855. (No. 1926.)

This invention consists in manufacturing continuous paper tubing—in machinery for making bags by folding, pasting, and closing one end of a piece of such tubing—

and in machinery for making bags by pasting a strip of paper over one end of a piece of such tubing.

STANSBURY, C. F. *An improved mill for grinding.* (A communication.) Patent dated August 25, 1855. (No. 1927.)

The peculiarity of this mill lies in the employment of a horizontal corrugated cylinder, in combination with a concave cap, the two being provided with corresponding spiral flanches.

STANSBURY, C. F. *An improved shirt wrist-band.* (A communication.) Patent dated August 25, 1855. (No. 1928.)

This invention consists in making shirt wrist-bands double, in order that when one has become soiled the other may supply its place.

CARLESS, E. *Improvements in the manufacture of artificial leather suitable for book-binding and other purposes.* Patent dated August 25, 1855. (No. 1929.)

The patentee employs felt, made either with cotton in combination with a solution of gutta-percha or caoutchouc which he deodorises, or otherwise. The material is deodorised by being passed through a bath of water containing chloride of zinc, and then over a series of heated cylinders until it is perfectly dry; or by passing it through the same bath after adding to the latter liquid ammonia or carbonate of ammonia, and proceeding as before.

HARDY, A. H., and J. H. FORDOFF. *A compound pill and ointment for the cure of scorbutic and similar disorders of the human body.* Patent dated August 25, 1855. (No. 1930.)

The improved pill is composed of aloes, jalap, buckthorne, oil of almonds, and calomel. The ointment is composed of lard, white precipitate, red precipitate, turmeric, and oil of origamme.

CAPRON, C. E. *An improved cupping apparatus.* Patent dated August 27, 1855. (No. 1933.)

In this apparatus a partial vacuum is produced by means of a vulcanised India-rubber ball, in connection with suitable valves.

COOLING, T. A. *Improvements in pumps.* Patent dated August 27, 1855. (No. 1935.)

This invention consists in casting the barrel or body of the pump, together with the top and bottom chambers or valve-boxes in one piece, and the application of the same method to two or three barrel pumps; also, in making the air vessel form a standard or support for the lever or handle of the pump, and in a method of connecting the lever or handle to a dip or other support by means of a single or double link, and of passing the handle through a slot or aperture in the air vessels, or through a standard used instead thereof.

HUMFREY, C. *Improvements in the manufacture of fatty and oily acids.* Patent dated August 27, 1855. (No. 1936.)

The inventor describes certain methods of obtaining from palm-oil, which is a highly-coloured substance, fatty and oily acids nearly colourless.

SAUTELET, E. C. F. *An improved impermeable cloth or fabric for sheltering, covering, and preserving in various purposes.* Patent dated August 27, 1855. (No. 1937.)

This invention consists in forming a fabric by cementing together by a glutinous and impermeable substance, flock, or the refuse wool or hair of animals.

SMITH, J. *Improvements in children's carriages or perambulators and invalid carriages.* Patent dated August 27, 1855. (No. 1938.)

This invention consists in constructing the bodies of such carriages of sheet metal, perforated or plain. The padding is secured by fastening it to wood screwed, nailed, or otherwise attached to the back, arm pieces, sides, seat, and foot-board of the carriage.

LUDBROOK, S. *Improvements in railway wheels.* Patent dated August 27, 1855. (No. 1939.)

This invention consists in forming the periphery or outside edge of railway wheels of wood, forced and pressed into and between suitable holding plates and chambers in such manner as to form a very hard and compact surface, with the grain of the wood so placed as to be at right angles, or as nearly so as may be to the surface of the rail at the point where the edge of the wheel comes in contact therewith.

JOHNSON, W. *Improvements in machinery or apparatus for rolling or shaping metals.* (A communication.) Patent dated August 27, 1855. (No. 1940.)

In carrying out this invention, the article to be rolled, instead of being passed between a pair of rolls in the usual manner, is laid with its axial line parallel to the axes of the rolls, three or more rolls being employed. The article is laid upon, or partially between the two lower rolls, which rotate in fixed bearings, whilst the upper roll works in vertical sliding bearings, actuated by screw spindles and bevil-wheels, which are driven from a main shaft by a small steam engine attached to one of the main standards of the rolling mill. By this means the upper roll is gradually brought down upon the article, and is kept pressed thereon until it has been reduced to the form and shape required.

JOHNSON, W. *Improvements in railway breaks.* (A communication.) Patent dated August 27, 1855. (No. 1941.)

A description of this invention is given on page 321 of this Number.

Humfrey, C. *The application of certain products of fatty and oily matters to the manufacture of candles and other uses.* Patent dated August 27, 1855. (No. 1942.)

The object of this invention is to apply to the manufacture of candles, &c., those products of fatty and oily matters obtained by the processes described in the specification of a patent dated August 27, 1855. With respect to the application of the said products to the manufacture of candles made to burn with spiral wicks, the inventor finds that the wicks ordinarily used are unable to sustain the heat of the combustion of the products, or that they are in some way chemically acted upon thereby; and to protect them from this destructive action, it is requisite to prepare the cotton of which such wicks are made. He finds that if the cotton in skeins previous to its being made into the ordinary gimped wicks used in this description of candles, or the wicks after they are made, be steeped in a solution of sulphate or other salt of ammonia, containing about 600 grains to the pint of water, and well dried, they will answer the purpose.

Esplin, C. *Improvements in apparatus for regulating the supply of gas.* Patent dated August 27, 1855. (No. 1943.)

This invention mainly consists in working the valve situated between the inlet and out chambers of the regulator, by attaching it to a balanced cover with turned down edges which dip into quicksilver, and compensating for the varying immersion of these edges by means of a tube carrying quicksilver.

Newton, A. V. *Improvements in separating substances of different specific gravities.* (A communication.) Patent dated August 27, 1855. (No. 1944.)

This invention mainly consists in the employment of what the inventor terms a grain separator, for separating the grains of metal from the earthy substances preparatory to, and in combination with, the crushing, when the separator is employed as a hopper to the crusher, and combined therewith by a feeding tube for conducting the substances to be crushed below the surface of the column of water in the crusher.

Bellford, A. E. L. *Improvements in percussion-guns.* (A communication.) Patent dated August 27, 1855. (No. 1945.)

This invention consists in a certain cap tube fitted in the gun-stock, a rocking primer which receives the cap from the cap tube at the back of the nipple, &c.

Moore, B. *Improvements in sewing machines.* (A communication.) Patent dated August 27, 1855. (No. 1946.)

The inventor describes certain improvements, illustrated by drawings, of which we may give a condensed account hereafter.

Fourdrinier, E. N. *Improvements in machines for cleaning table-knives.* Patent dated August 28, 1855. (No. 1948.)

This invention consists in arranging the parts of a machine so that the several knives may be properly held, and so that the rubbing shall be in the direction of the length of the blades, for which purpose either the rubbers or the knives may be fixed, and the other moveable. It is, however, preferred that the knives should be moved to and fro between stationary or fixed cleaning or rubbing surfaces.

Brooman, R. A. *Improvements in umbrellas.* (A communication.) Patent dated August 28, 1855. (No. 1949.)

This invention mainly consists in forming the staff of an umbrella in three pieces, and each of the ribs in two, so that the umbrella may be folded up.

Rosson, C. P. *Certain improvements in machinery or apparatus employed for dressing and finishing textile fabrics by the application of a new material in the place of hogs' bristles, or wire cards hitherto employed therein.* Patent dated August 29, 1855. (No. 1951.)

This invention consists in the substitution of "ketool" for hogs' bristles.

Hanson, J. *Improvements in machinery or apparatus for digging or working land, and removing roots or plants therefrom.* Patent dated August 29, 1855. (No. 1953.)

This invention is mainly based on the machine described in our Number for 1st March last (page 204 of No. 1699.) In this invention the potato-digging apparatus is replaced by other rotating parts capable of effecting the further operations now contemplated; viz., digging the soil as a substitute for ploughing, clod breaking, turnip and root thinning, and hoeing. The actual working parts, in ploughing or digging, are knives or slicers so arranged as to cut up, turn, or work the soil. In hoeing, the rotatory forks are dispensed with, and the throwing up of the earth is produced by a share.

Radcliffe, C. *A machine or apparatus for moistening or "damping" woollen or other textile fabrics for finishing.* Patent dated August 29, 1855. (No. 1954.)

This machine consists of a framework and rollers by which fabrics may be traversed at a suitable distance from a brush which rapidly revolves within a trough supplied with water (regulated by a tap) through a perforated bottom. A second brush is also applied close to the fabric, and apparatus for cutting or folding the fabrics is added.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Parod, E. *Certain improvements in the steering of steam and other vessels.* Application dated August 23, 1855. (No. 1908.)

This invention consists in placing a screw propeller on a shaft so that it can take a position oblique or perpendicular to the axis of the vessel, and consequently push the stern of the vessel round, and thus steer it.

Frooms, H. *Improvements in the manufacture of pianofortes.* Application dated August 24, 1855. (No. 1916.)

This invention consists—1. In the use of compensating metal bracings to sustain the rest plank and metal plank. 2. In the use of conductors or apertures made in the sides of the instrument, through which the tone is reflected by means of a hollow semicircular piece of wood fixed perpendicularly at each end inside of the instrument. 3. In the use of equal tension-rods, formed of metal, and of varied lengths to suit the strings, one end being bent at right angles, and driven through a perforation in the metal plate into the hard wood beneath. 4. The application of a steel medium wire coated with copper.

Gooding, W. S. *A tailor's clay-cutter.* Application dated August 24, 1855. (No. 1917.)

The inventor makes a hollow frame or stand with two roughened plates placed in a diagonal position over its opening or mouth. When the clay is passed backwards and forwards against the projection of the plates it receives a fine edge, and the dust falls into the stand.

Radiguet, T. A. *An improved dynamical apparatus for motive power.* Application dated August 24, 1855. (No. 1919.)

The inventor proposes to obtain motive power by means of a number of balls, each of which acts upon a rotating motor-wheel during one part of its revolution, and is then conveyed back to its former position, and again made to act upon the wheel, the power necessary to return it to its former position being supplied by the succeeding ball, and so on.

Efferts, P. *Improvements in machinery for making bricks, tiles, pipes, and other similar articles.* Application dated August 24, 1855. (No. 1920.)

The inventor constructs a machine consisting of two square vessels, placed side by side, and each provided with a piston which exerts pressure during its upward strike. The mould slides in between the top of the vessel and a cover, over which cover is suspended a frame carrying knives. The clay is fed into the vessels at the top, after passing through the frame above from an endless chain of buckets.

Le François, H. *An apparatus for cleaning stew-pans, and other similar culinary utensils.* Application dated August 25, 1855. (No. 1931.)

This apparatus consists of a frame furnished with jaws in which a utensil is firmly held, while acted upon, within and without, by revolving brushes which centre on the frame.

Rualem, F. *A new process for manufacturing fuel for household and general purposes, called "The Imperial Coal."* Application dated August 27, 1855. (No. 1932.)

The inventor mixes coaldust, cokedust, charcoaldust, sawdust, coffee grounds, iron filings, and resin, and then moulds and bakes the mixture.

Robson, J. W. *Improvements in water-closets.* Application dated August 27, 1855. (No. 1934.)

This invention particularly relates to water-closets rendered self-supplying with water by means of a spring seat, and consists in the application of a flexible diaphragm and tube, which, in connection with a metallic pipe, are worked by an ordinary lever, thus operating on valves through which water is supplied to the pan of the closet. It consists, further, in applying the flexible diaphragm to a conical pump, whereby valves are worked, causing the soil to be drawn from the basin and forced from the closet.

Hopkinson, J. *Improvements in furnaces.* Application dated August 28, 1855. (No. 1947.)

This invention consists in forming in the central part of the fire-bars, a raised portion provided with a series of openings, constituting a surface similar to that of the ordinary bars. These openings are inclined to facilitate the use of the rake, and the whole is so formed that it decreases in elevation as it extends from the back part of the furnace towards the dead plate.

Booth, J. *Improvements in machinery for drilling and boring.* Application dated August 29, 1855. (No. 1950.)

These improvements consist in so connecting the end of the article to be drilled or bored to the face-plate of the lathe, or other revolving agent, that it shall be at liberty to move in any direction, and in dispensing with the rest usually employed. A cylindrical tool is preferred for drilling or boring, and the tool is supported close to the end of the article to be drilled or bored. By this arrangement the tool serves as a support for one end of the article, and the other end being capable of moving in any direction, gives way to the tool.

Stansbury, C. F. *An improved seed-*

planter. (A communication.) Application dated August 29, 1855. (No. 1952.)

This invention consists of a mechanical seed-planter, in which feed rollers with elastic surfaces are combined with an expanding tubular spreader.

GEDGE, J. *Improvements in galvanizing substances*. Application dated August 30, 1855. (No. 1956.)

In this invention (the nature of which it is difficult to discover) it is proposed to make the bath in a vase of sandstone, or one of wood lined with gutta percha, "filled with three parts of water," and to place therein several open-work baskets, containing powdered sulphate of copper, allowing several days for its dissolution, "and adding thereto until the bath shall have attained twenty or twenty-five degrees." In arranging the piles, a porcelain tube, and a blade of zinc of the same size as the interior of the tube, but longer, are taken, passing above the zinc blade a narrow band of brass wire; the pile is then put into the bath, water being introduced into the tube. To the object to be galvanized are attached seven or eight conducting wires, their ends being twisted together in the form of a hook which is hooked on to the brass wire band, the band being soldered to the zinc blade. The pile thus prepared, the objects are to be suspended in the bath, and a few drops of sulphuric acid are then to be added to the water in the tube.

PROVISIONAL PROTECTIONS.

Dated March 6, 1856.

561. Luke Duncan Jackson, engineer, Alfred-place, Alfred-road, Middlesex, and Henry Myers, medical practitioner, Alfred-road, Paddington, Middlesex. The combining air and water as a power.

Dated March 10, 1856.

579. Robert Hannah, of Glasgow, Lanark, North Britain, pottery manager. Improvements in pottery kilns.

581. Pierre Denis Nolet, of Rue de la Lune, Paris, practical engineer. Improvements in penholders.

583. Robert Smith Bartleet, of Redditch, Worcester, manufacturer. Improvements in cases or holders for machine and other sewing needles.

585. Francis Joseph Emery, of Cobridge, Stafford, gentleman. An improved means of arresting the descent of cages or corves in the shafts of mines, which may also be applied to stopping the fall of weights.

Dated March 11, 1856.

587. Alexandre Tolhausen, Duke-street, Adelphi, Middlesex, Sworn Interpreter at the Imperial Court of Paris. Certain improvements applicable to bakers' ovens. A communication from Hiram Berdan, of Flatland, United States.

589. Henri Greene, of Windlesham, near Bagshot, Surrey, civil engineer. Improvements in locomotive engines and carriages running on railways. A communication.

591. Henry Petitpierre, Avenue de St. Ouen Batignolles, near Paris, engineer. Improvements in sawing or cutting stone.

Dated March 12, 1856.

593. Henry Horner and Richard Bagley, of Sheffield, York. Improvements in buffers and draw and bearing springs for railway and other purposes.

594. George Spencer, of Cannon-street, engineer, London. Improvements in supporting the rails of railways.

595. John Martin Stanley, George Bellamy, and William Booth, of Sheffield, York, general ironfounders. Improvements in the manufacture of rolls for rolling steel, copper, lead, or other malleable material.

596. Christopher Richard Norris Palmer, Strand, Middlesex, telegraph engineer. A new telegraph and improved telegraph or signal apparatus, parts of the invention, apparatus, or manufacture, being applicable to other purposes.

597. John Vigars, of Marytavy, near Tavistock, Devon. Improvements in machinery for lifting in mines, also applicable to other purposes.

598. Edmund Alfred Pontifex, of Shoe-lane, city of London, chemical manufacturer. Improvements in the manufacture of tartaric and citric acids and tartrate of potash and soda.

599. Liphar Mathurin Chalange, miller, of Nogent-sur-Seine, French Empire. Certain improvements in corn-mills.

600. William Corbitt and George Shaw, of Masbro' Works, Rotherham, York, engineers and ironfounders. Improvements in buffer bearing and draw springs for railway and other carriages.

601. Frederic Howarth Edwards, of Newcastle-upon-Tyne, engineer. Improvements in railway brakes.

602. William Bramwell Hayes, of Manchester, Lancaster, manufacturer. Certain improvements in looms for weaving.

603. John Northcote Ryder, of Thames-street, London. An improvement in the slide-valve of steam engines.

604. George Murray, of Whitehill-point, Northumberland, engineer. An improvement in the construction and manufacture of wheels for locomotive engines, wagons, and other carriages, to be used on railways.

605. Thomas W. Taylor, of Cannelton, Perry, State of Indiana, North America. An improvement in flying or roving frames.

Dated March 13, 1856.

607. Pierre Hippolyte Gustave Bérard, merchant, of Paris, Empire of France. Improvements in the manufacture of waterproof fabrics, which improvements may also be applied for rendering other substances waterproof.

608. Joseph Sturge, of Kennington, Surrey, and Alfred Sturge, of Northfleet, Kent, engineers. Improvements in rotary fluid meters.

609. George Rees, of Clerkenwell, Middlesex, painted and stained glass manufacturer. An improved method of producing figured or ornamental surfaces on glass.

610. Isaac Dixon, of Liverpool, Lancaster, builder. An improved propeller for steam ships and other vessels.

611. Grand de Chateauneuf, Rue de l'Echiquier, Paris, Empire of France, civil engineer. A hydro-pneumometric gas meter.

612. Thomas Porter, of Manchester, Lancaster, merchant. Improvements in looms for weaving carpets, coach-lace, velvets, and other piled fabrics. A communication.

613. James Murdoch, Staple-inn, Middlesex. An improved mode of manufacturing cut velvets and other similar fabrics. A communication.

Dated March 14, 1856.

615. Prosper Pimont, of Rouen, France, manufacturer. A certain process for restoring metallic spoiled pens.

616. Charles Durand Gardissal, Bedford-street, Strand, London. An improvement in capstans. A communication.

617. Charles Durand Gardissal, Bedford-street, Strand, London. An improvement in ships' windlasses. A communication.

618. Phillip Marcus, of Well-street, Middlesex, outfitter. An apparatus for working the damper in steam-engine furnaces. A communication from John Taylor, of New Jersey.

619. William Yates, of Bromley, Middlesex, engineer. An improvement in furnaces.

620. William Clay, of Liverpool, Lancaster, iron-merchant. Improvements in the manufacture of the points or switches and crossings of railways.

621. William Edward Newton, Chancery-lane, Middlesex, civil engineer. Improved machinery for separating gold and other metals from their ores. A communication.

Dated March 15, 1856.

622. Charles Coates, of Sunnyside, near Rawtenstall, Lancaster, manager. Improvements in apparatus for communicating motion to machinery used in bleaching, printing, dyeing, and finishing fabrics.

623. Louis Joseph Richard, of Tirlemont, Belgium, sugar refiner. Improvements in sugar manufacture.

624. Joseph Benjamin Hawkins, of Reading, Berkshire, cabinet maker. Improvements in couches or sofas, parts of which are applicable to other like furniture.

625. Edwin Thomas Wright, of Wolverhampton, Stafford, engineer. An improvement or improvements in the manufacture of steam-engine boilers, iron ships and boats, and such other vessels and things as are or may be made by riveting together metal plates.

626. Robert Walter Winfield, of Birmingham, Warwick, merchant and manufacturer, John Sims, of Fleet-street, London, commercial agent, and Thomas Lloyd, of King's Norton, Worcester, brass-founder. Improvements in the construction and ornamentation of metallic bedsteads and other articles of metallic furniture.

627. James Rice, of Foley-place, surgeon, and William Rice, Lieutenant H.E.I.C.S. Improvements in breech-loading repeating guns and rifles.

628. Joseph Dumas, of Marseilles, Empire of France. An improved description of tile. A communication, and recently patented in France, in the name of Frederick Arnaud.

629. William Oldham, of Southam, Warwick. Improvements in the manufacture of cement.

630. Henry Bessemer, of Queen-street-place, New Cannon-street, London. Improvements in the manufacture of iron and steel.

631. Charles Randolph and John Elder, Glasgow, Lanark, engineers. Improvements in marine-engines.

632. Joseph Pegg, of Monkwearmouth, Durham, shipowner. Improved steering apparatus.

Dated March 17, 1856.

633. John Mitchell, of Dunnings-alley, Bishopsgate-street Without. Improvements in apparatus for washing and amalgamating ores and other matters.

635. Charles Benjamin Normand, of Havre, France, shipbuilder. Improvements in the treatment and employment of steam in steam engines, and in apparatus for effecting the condensation of steam.

637. Thomas Palmer, of Tavistock, Devon, currier. Pumps with a new or improved box and valve.

639. William Graham, of Glasgow, Lanark, North Britain, master mariner. Improvements in marine compasses, and in adjusting the same on board ship.

Dated March 18, 1856.

641. Peter de Prades, of Camden New Town, Middlesex, gentleman. Improvements in wheelbarrows.

643. Edward Rowley, of West Bromwich, Stafford, iron roller, and John Hadley, of Birmingham, Warwick, engineer. A new or improved method of shaping iron.

645. John Drury, of Paddock, near Huddersfield, York, machine maker. Improvements in steam boilers for preventing explosion thereof.

647. Harby Barber, of Belgrave, near Leicester, manufacturer of hosiery. Improvements in the manufacture of hosiery goods.

649. Peter Appleton, London-street, New Swindon, Wilts. Improvements in knives for peeling apples, potatoes, and other fruits and roots.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

650. Lazare Ochs, of Saint Josse ten Noode, Belgium, manufacturer. Improvements in the manufacture of certain kinds of paper from the refuse of tanned leather. (A communication.) March 19, 1856.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," April* 1*st*, 1856.)

2596. Joseph Shaw. Improvements in the prevention of accidents arising from collisions on railways.

2601. Josiah Pratt and Thomas Radcliffe. Improvements in the manufacture of brushes.

2610. John Poole. An improved mode of regulating the supply of steam from the boiler to the cylinder, and thereby better governing the motion or speed of steam engines.

2615. Peter Armand Lecomte de Fontainemoreau. Improvements in apparatus for preventing horses from running away. A communication.

2624. William Cooke. Improvements in gas and solar light reflectors.

2631. John Roberts, junior. A machine or apparatus for cooling tobacco during the process of manufacture.

2634. Henry Hibling. Improvements in waterproof boots and shoes.

2636. Frederic Lotteri. Obtaining fibre from the bark of trees of the morus family or class, and the application thereof to the manufacture of paper and textile materials, and for other useful purposes.

2640. Thomas Tuckey. Modes of construction by which steam or other vapour or gas may be used as a source of motive power for some purposes more conveniently than hitherto, and more suitably for locomotion on common roads.

2644. Joseph Ellisdon. Improvements in "castors" for cabinet furniture.

2650. John Jephson Rowley. Improvements in machinery for cleaning and cutting turnips and other roots.

2657. John Wilkes. An improvement or improvements in the manufacture of tubes of copper and alloys of copper.

2659. François Coignet. Certain improvements in the use and preparation of plastic materials or compositions to be used as artificial stone, or as concrete, or cement for building and other purposes.

2665. Robert Bell. Improvements in the manu-

facture of woven fabrics when made of wool and cotton, or of wool, cotton, and silk.

2675. George Louis Stott. Improvements in the manufacture of carbonate of soda.

2685. Benjamin Rosenberg. Improvements in protecting metallic and other surfaces from corrosion and decay. A communication.

2698. George North. An improved portable apparatus for supporting and folding heads, tilts, coverings, and awnings of wheel carriages, marine vessels, goods, and ways.

2699. Pierre Louis Bergeon. An improved spitting box or spittoon. A communication.

2771. Herman John van den Hout and Ebenezer Brown. Improvements in utilising leather shavings.

2794. Alexandre Tolhausen. Certain improvements in mariners' and land compasses. A communication from John Prime, Washington, United States.

2833. John Aspinall. Improvements in machinery for curing sugar and extracting moisture therefrom, parts of which are applicable to separating liquids and moisture from substances containing the same.

2847. John Lobb Jeffree. Improvements in or additions to furnaces.

2898. William Joseph Curtis. Improvements in fog signals, and in laying the same upon the rails of railways.

217. Wilhelm Dreschfeld. An improvement in or addition to rollers employed in spinning.

267. George Hallen Cottam and Henry Richard Cottam. Improvements in folding bedsteads and chairs.

420. William Gwillim Merrett. An improvement in trowsers and drawers.

434. John Henry Johnson. Improvements in machinery or apparatus for lubricating bearings, parts of which improvements are applicable to the raising or elevating of liquids. A communication.

492. Philipp Schäfer and Frederick Schäfer. An improved apparatus for damping gummed stamps, tickets, labels, and envelopes.

562. Henry Davis Pochin. Improvements in the manufacture of aluminous and siliceous compounds.

571. Chevalier Guillaume Hähner. Certain improvements in the treatment of ores. A communication.

572. David Brown and William Brown. An improvement or improvements in rolling railway switches from railway bars, and in rolling taper ends on other bars requiring the same.

583. Robert Smith Bartleet. Improvements in cases or holders for machine and other sewing needles.

623. Charles Coates. Improvements in apparatus for communicating motion to machinery used in bleaching, printing, dyeing and finishing fabrics.

630. Henry Bessemer. Improvements in the manufacture of iron and steel.

633. John Mitchell. Improvements in apparatus for washing and in amalgamating ores and other matters.

639. William Graham. Improvements in marine compasses, and in adjusting the same on board ship.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

732. James Worrall, junior.
737. Thomas James Perry.
740. George Edward Dering.
741. George Edward Dering.
744. Luke Smith and Matthew Smith.
750. Lawrence Frederick Keogh.
757. Julian Bernard.
763. Christopher Nickels.
773. George Hanson and David Chadwick.
797. William Beckett Johnson.
859. William Penn Cresson.
890. James Noble.
894. James Noble.
974. Cyprien Marie Tessie du Motay.
985. George Ferguson Wilson, William Henry Hatcher and John Jackson.

LIST OF SEALED PATENTS.

Sealed March 20, 1856.

182. Archibald Turner.
232. John Whitehead.

Sealed March 25, 1856.

2161. William Davy Gray.
2170. Henry Bernoulli Barlow.
2173. David Chadwick, Herbert Frost, George Hanson, and John Chadwick.
2181. Auguste Edouard Loradoux Bellford.
2192. Alexander Sands.
2214. John Lancaster.
2234. Adolph Coutinho.
2255. Julien François Belleville.
2289. Hugh Greaves.
2296. George Tomlinson Bousfield.
2298. George Tomlinson Bousfield.
2368. Vincent Scully and Bennett Johns Heywood.
2372. William Shears.
2386. Alfred Ardouin.
2395. Edwin Pugh.
2403. Peter Cranke Wood.
2429. Thomas James Swinburne.
2446. Edwin Thomas Truman.
2509. William Lund and Alexander Bain.
2825. Alfred Krupp.
2853. William Hemsley.
2861. Christopher Nickels and James Hobson.
2957. James Cochran Stevenson and John Williamson.
27. John Fowler, junior.
56. Alfred Vincent Newton.
214. Jean Louis Ambroise Huillard.

Sealed April 1, 1856.

1376. James Lowe.

2186. Joseph François Victor Augier.
2187. George Baker and Charles Miller.
2191. John Riddel Musgrave, Robert Musgrave, and James Musgrave.
2194. Laurent Marie René Péan.
2195. George Rennie.
2198. Julian Bernard.
2209. Robert Wilkinson.
2216. Thomas Henry Ryland.
2223. François Modeste Demait.
2224. Peter Alexander Halkett.
2233. William John Roffe.
2258. Stephan Goldner.
2290. Germain Adolphe Thibierge.
2313. William Edward Newton.
2341. John Smith.
2343. William Armand Gilbee.
2351. Pierre Arnaud Massip.
2353. Nathaniel Shattswell Dodge.
2392. Thomas Beat Sharp and Richard Furnival.
2422. Jules Jean Baptiste Sylvain Martin de Lignac.
2430. Thomas Shipp Grimwade.
2473. Robert Spring Garden.
2497. Charles Hanson.
2504. Louis Benoit Advielle.
2571. Alfred Vincent Newton.
2595. Robert Walter Swinburne.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

The letters of C. J. Recordon, and M. S. Maynard, upon "Mechanical Locomotion" have been received. Further letters on this subject must be short, or they certainly will not be inserted.

G. W. Heslop.—Yours is received.

G. H. Pointer.—We cannot undertake to give you the information you require respecting boilers for breweries. For an article on "Barran's Cup-surface Boiler" *See Mechanics' Magazine* for August 18, 1855, No. 1671, vol. lxiii. Communications respecting this boiler should be addressed, we believe, to Messrs. R. and T. Hughes and Co., Railway Foundry, New Cross.

CONTENTS OF THIS NUMBER.

Dunn's Duplicate Retort Steam Boiler (*with engravings*) ... 313
Faraday's Experimental Researches in Electricity (*continued from page 247*) ... 315
Mickle's Improvements in Producing Iron from the Ore ... 319
Draper's Improved Oil-can ... 321
Kind's System of Mine-boring ... 321
Didier's Improved Railway Breaks ... 321
The Smoke Question. Award of the Society of Arts' Prize ... 322
Exhibition of Inventions at the Society of Arts ... 322
On the Prospects of Steam Culture ... 322
The Voltaic Battery and Blasting ... 323
Chattaway's Buffing and Coupling Apparatus ... 324
Mechanical Locomotion ... 324
Specifications of Patents recently Filed:
Bergh ... Packing Pistons ... 328
Lownds ... Pen and Pencil-case ... 328
Zinkernagel ... Mosaic Work ... 328
Wyche ... Propelling ... 328
Jones ... Printing Fabrics ... 328
Claus ... Unhairing Hides ... 328
Fouchier ... Mill-stones ... 328
Martien ... Oxides of Iron ... 329
Denton ... Combing-machines ... 329
Thomas ... Projectiles ... 329
Kidman ... Tillers or Yokes ... 329
Bartlett ... Drilling Stone ... 329
Archer ... Photography ... 329
Wood ... Pile Fabrics ... 329
De la Rue ... Printing Inks ... 329
Schlickeysen ... Pipes, Bricks, &c. ... 329
Avery ... Handles for Drills ... 329
Avery ... Exhausting Vessels ... 329
Avery ... Closing Gates ... 329
Avery ... Sewing-machines ... 329
Brown ... Paper Bags ... 329
Stansbury ... Grinding-mill ... 330
Stansbury ... Shirt Wristband ... 330
Carless ... Artificial Leather ... 330
Hardy and Fordoff ... Anti-scorbutic Pill ... 330
Capron ... Cupping Apparatus ... 330
Cooling ... Pumps ... 330
Humfrey ... Fatty Acids ... 330
Sautelet ... Fabric ... 330
Smith ... Perambulators ... 330
Ludbrook ... Railway Wheels ... 330
Johnson ... Rolling Metals ... 330
Johnson ... Railway Breaks ... 330
Esplin ... Gas-regulator ... 331
Newton ... Separating Substances 331
Bellford ... Percussion-guns ... 331
Moore ... Sewing-machines ... 331
Fourdrinier ... Cleaning Knives ... 331
Brooman ... Umbrellas ... 331
Rosson ... Textile Fabrics ... 331
Hanson ... Working Land ... 331
Radcliffe ... Damping Fabrics ... 331
Provisional Specifications not proceeded with:
Parod ... Steering Ships ... 332
Frooms ... Pianofortes ... 332
Gooding ... Tailors' Clay-cutter ... 332
Radiguet ... Motive Power ... 332
Effertz ... Making Bricks, &c. ... 332
Le François ... Cleaning Culinary Utensils ... 332
Rualem ... Artificial Fuel ... 332
Robson ... Water-closets ... 332
Hopkinson ... Furnaces ... 332
Booth ... Drilling and Boring ... 332
Stansbury ... Seed-planter ... 332
Gedge ... Galvanizing Substances ... 333
Provisional Protections ... 333
Patent Applied for with Complete Specification ... 334
Notices of Intention to Proceed ... 334
Patents on which the Third Year's Stamp-Duty has been Paid ... 335
List of Sealed Patents ... 335
Notices to Correspondents ... 336

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

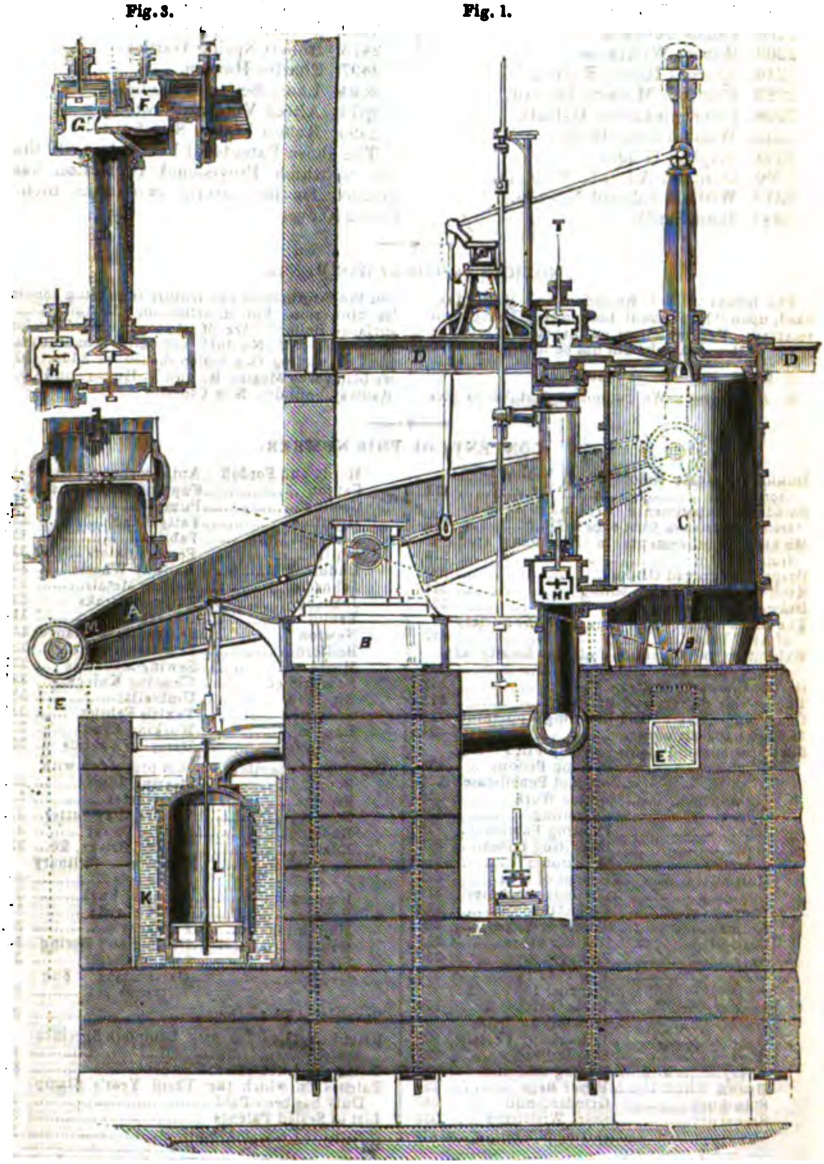
Mechanics' Magazine.

No. 1705.] SATURDAY, APRIL 12, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

FAIRBAIRN'S IMPROVED PUMPING ENGINE.

Fig. 3. Fig. 1.



FAIRBAIRN'S IMPROVED PUMPING ENGINE.

In mining operations the Cornish Pumping Engine has for many years been considered the most eligible for raising water from great depths. In the district of Cornwall, where coal is not one of the native mineral treasures, and where the fuel has consequently to be imported for the supply of the numerous engines employed for draining the tin and copper mines, economy in the consumption of the fuel has always been an object of great importance. Owing to the high price of the imported coal, and the consequently large item that it forms in the annual charges for steam power, greater attention has been paid to the construction and working of the engines, which has resulted in superior economy; and the Cornish mine-owners have lost no opportunity of affording to the engineer every facility for improvements in the engines and boilers, and at the same time every inducement to those in charge of their management to promote their economical working. The encouragement offered by rewards and premiums has given to the Cornish engine its high character for economy in the consumption of coal: and though in other districts, where coal is cheap and abundant, the same necessity for stringent measures to ensure carefulness does not exist, this can be no justification for wasteful expenditure, and neglect of applying the proper means to attain that economy, with which the whole of the steam power in the country ought to be worked. A knowledge of what has been advantageously accomplished in one district is a motive for its introduction into another, and Mr. Fairbairn, being convinced of the superior management prevalent in Cornwall, has always advocated the more general adoption of this important system.

When water has to be raised from great depths by steam power, there appears, says Mr. Fairbairn, to be no better method of doing so than to use the Cornish engine working expansively, employing the engine to raise the plungers and pump rods, the weight of which, as they descend, forces the water up to the surface or next level. This has been for many years the practice in Cornwall, and has been almost invariably accomplished by a powerful engine with its main working beam placed above the cylinder. For such a position, the lever wall, &c., supporting the beam, is required to be a mass of solid stone-work, of considerable height, to resist the shocks to which it is subjected by the sudden descent of the load upon the spring beams, and which are at times so great in a large engine as to shake the masonry to its foundations. In the engine designed by Mr. Fairbairn, and described in the present paper, this objection is avoided, and the expense of high buildings and massive masonry is saved, by substituting for the single main working beam above the cylinder, two beams placed below the cylinder, one on each side of the engine, resting upon a platform level with the ground, and in the present instance below the mouth of the pit. The advantage of this construction is, that the whole strain at the bearings of the beams, instead of acting upon the raised tower of the lever wall, is brought direct upon the solid ground, thereby saving the expense of the masonry above the ground. In case the engine should miss a stroke from an accident in the pit, the shock is received upon a massive oak transverse spring beam, which passes under the cylinder and rests upon the foundations of the engine house on each side. A corresponding spring beam is fixed in the pit to receive the fall of the pump rods whenever they happen to pass beyond the limits of the stroke in their descent. This modification in the arrangement has the advantage of making the foundations sustain the weight and shocks of the engine direct, and causes a great saving in the original cost.

The principle of the engine itself presents no material difference from the ordinary construction, and the arrangement is compact, simple, and effective; the engine is worked with double-beat valves, and is so arranged as to cut off the steam at any part of the stroke.

A number of engines on the same plan are now at work, some of them of great power, with 70 to 80 inch cylinders, and they have given complete satisfaction by their steady, convenient, and economical working.

The engine shown in the accompanying engravings was erected by Mr. Fairbairn in 1851, at the colliery of F. P. D. Astley, Esq., at Dukinfield; it is a single-acting high-pressure expansive and condensing engine, of about 100 horse power effective, employed to drain a coal-pit of large extent. The depth from which the water is raised is at present rather more than 500 yards, but the extreme depth to which it is intended to work will be about 700 yards, when the lower bed of coal is reached. Fig. 1 shows a longitudinal section, and fig. 2 is a transverse section of the engine. Figs. 3 and 4 show the details of the valves. The two beams, A A, are carried upon the same frame or bed-plate, B B, as the steam cylinder, C, and each is bolted down to a block of masonry at the level of the floor. The cylinder is 70 inches diameter, and 8 feet stroke; the piston-rod is connected to the beams

by a wrought-iron cross-head and cast-iron side rods, as in the ordinary marine engine, a similar parallel motion being used, which in this case is carried by two parallel girders, D D, fixed in the walls of the engine house, and bolted to the flange of the cylinder. E is the oak spring-beam, 22 inches square, extending transversely under the cylinder, and carried at the ends by the foundations of the building. The ends of the engine-beams strike directly upon the spring-beam, with the intervention only of a block of timber placed upon the spring-beam, with a thickness of India-rubber as a packing to soften the blow. A similar provision is made at the opposite end of the engine beams, to prevent the pump-rods descending too far.

The valves are all on the double-beat construction; the steam valve, F, is 16½ inches diameter in the seat, and the equilibrium and eduction valves, G and H, are 18½ inches diameter, their motion being regulated by the cataract, I, in the usual manner of the Cornish engines.

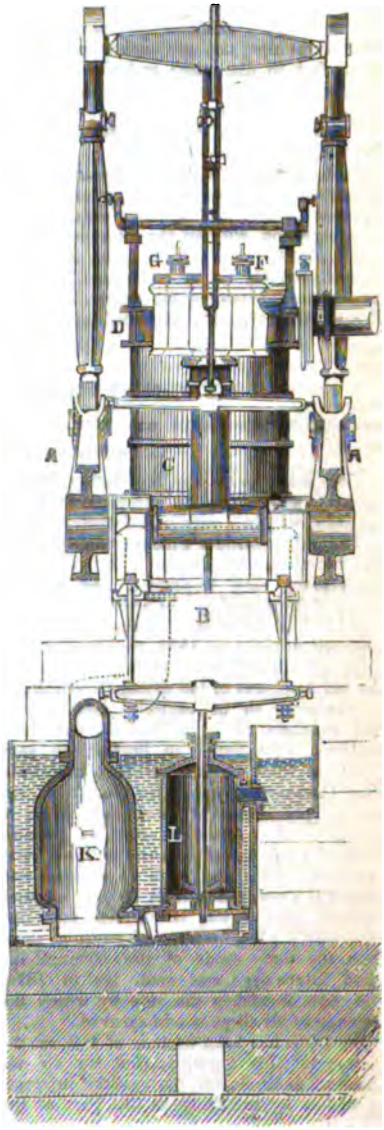
The condenser, K, and air-pump, L, are placed in a well below the floor on the opposite side of the centre of the beam; the air-pump is 35 inches diameter and 4 feet stroke.

The outer extremities of the beams, A A, overhang the pit at M, where they are attached to the pump-rods by means of a parallel motion. The pair of beams forming the parallel motion are fixed one on each side of the pit in recesses, working clear of the pit; they carry at their outer ends a large counterbalance weight, consisting of a box filled with cast-iron weights, to counterpoise a portion of the weight of the pump-rods, leaving only sufficient unbalanced weight for raising the water in the pumps.

The pumps consist of six sets of plunger pumps, commencing with one bucket pump at the bottom. The main pump-rod has a stroke of 8 feet, and is 15 inches square at the top, being attached by a wrought-iron strap to the cross head of the parallel motion. The first four pumps are all of the same size, with 12 inch plungers, and 12 inch rising main; the pump-rod diminishes in size from 15 inches square at top, to 11 inches square at the fourth pump down, and 8 inches square at the two lowest plunger pumps, and each of the plungers is attached to it by a timber block and iron straps.

The two lowest plunger pumps are of similar construction and dimensions, except that they are smaller in diameter, the plungers being only 8 inches diameter, and the rising main 8 inches; the difference is made in consequence of a portion of the water entering from a higher level of the workings into the cistern of the fourth pump. The bottom pump is a bucket and plunger pump, raising the water at both strokes of the pump-rod. The barrel of the pump is 8

Fig. 2.



inches diameter, and the pump-rod 5 inches square, being half the area of the barrel, so that half the water is raised at each stroke.

The suction and delivery valves are leather flap valves, with two semicircular openings. Each pump has the same lift, and raises the water 200 feet, delivering it into the cistern from which the succeeding pump draws. The engine makes about 13 strokes per minute, and the quantity of water raised is consequently 500 gallons per minute, being equivalent to about 160 horse power effective.

The pumps and pit work have been arranged with a view to saving room, and at the same time affording facility for repairs, and convenient access to the valves and buckets of each of the sets into which the pumps are divided. The entire space occupied by the six sets of plunger pumps, and one bucket pump, is only about one-fifth of the area of the shaft, which is 12 feet in diameter; and the shaft not only contains the pumps to a depth of 1500 feet, but also has space enough for the ascent and descent of two sets of boxes, each box containing about 8 cwt. of coal. A description of the large winding engine, used to raise the coal in this pit, was laid before the Institution at a former meeting (see Proceedings Inst. M. E. December, 1853).

J. Ramsbottom, Esq., the Chairman, after the reading of the paper, observed that the arrangement appeared more judicious than the old plan of the beam at top, as the engine was more compact, and the principal strains and shocks were brought directly to the level of the ground, without the intervention of walls or columns.

Mr. Beyer had seen the engine at work, and thought it one of the finest pumping engines he had seen; it was well executed, and appeared to work well; the engine and pumps were conveniently arranged for access, and the fixing of the beams was solid and simple; he thought the arrangement would be found to be generally preferable.

MERCHANT SHIPPING REGISTRATION ACT.

MR. ATHERTON'S PAPER ON TONNAGE REGISTRATION READ BEFORE THE SOCIETY OF ARTS, ON 16TH JANUARY, 1856.

For many years the legislation in this country, with regard to admeasurement of tonnage, was in a very unsatisfactory state.

The old, or builder's measurement, which was sanctioned by law for many years, was confessedly very imperfect, and was the cause of the prevalence of a very bad type of build in our merchant shipping. This was replaced in the year 1833, by a rule which, although allowed to be an improvement on the old rule, was of too decidedly empirical a character to be entirely satisfactory; and evasions of it, on the part of ship-builders, were found to present no very great, at least no insuperable difficulties. The Committee, appointed in 1849, under the presidency of Lord John Hay, to consider the tonnage question, recommended a scheme of *accurate external measurement*. This met with so decided and powerful a resistance from the ship-owning interest, that it was withdrawn, and Mr. Moorsom's plan, which is nothing more than the same mode of measurement, applied internally, was made law in 1854, and now furnishes the rule by which the tonnage of all ships is admeasured.

So much has been written of late on the history of this question, that we do not think we shall consult our readers' interests or wishes by enlarging on this part of the subject.

Scarcely has the new rule been in operation a year, when we find it assailed—not by the ship-builders and ship-owners certainly—but by a class who assume much higher ground, who come forward as the champions of science, which they consider outraged by the enactments of the Merchant Shipping Act. Their Coryphæus is Mr. Atherton, the chief engineer of H. M. Dockyard, Woolwich, who, in an elaborate paper read before the Society of Arts, on the 16th of January last, lays to the door of the present law consequences of the most alarming nature, and wages an internecine war with the tonnage admeasurement, in the same way as he did with the measurement of horses-power for marine engines last year. This assault has provoked one or two replies from ship-owners, who felt their craft insulted by some of his remarks, showing a sensibility on the occasion which would go far, with some people, to prove the truth of those imputations they are so ready to extract from Mr. Atherton's words. Especially, we notice a letter of Mr. Lindsay, because he is eminent as a ship-owner. That gentleman's capabilities, as an administrative reformer, he has had several opportunities of showing to the House of Commons. The duel between him and Sir Charles Wood, last year, must be in every one's recollection; and we believe few, except Mr. Lindsay himself and his most ardent admirers, consider him to have come out of that contest—we will not say with flying colours—but without having suffered much more damage than he inflicted. In his letter

in reply to Mr. Atherton, he takes pains to inform us that his whole education was gained before the mast; that his whole knowledge is of a practical character. This information is superfluous, as the whole tone of the letter sufficiently indicates the kind of education Mr. Lindsay possesses. We would only beg to impress on that gentleman the consideration that, although he may find many willing to be amused with his sallies, and whose palates may be agreeably stimulated by the strong dishes of personalities he serves up for them, yet very few would think any the worse of his opponent or any the better of him, for these, which Mr. Lindsay makes the strong points in his case, but which the good judgment and good taste of those whom they are intended to influence must reject as worthless for anything but amusement. Dismissing, then, these, as Mr. Disraeli perhaps would call them, flowers and ornaments of the question in dispute, we propose calmly and dispassionately to consider the case, as between the present law, the Government, and its other abettors, on one hand, and Mr. Atherton and his suggested changes on the other. We wish in this inquiry to avoid everything of a personal nature, entertaining, as we do, a profound respect for Mr. Atherton, though we may not altogether agree with all that he has written.

To discuss this matter fairly to all parties concerned, it is only right to consider under what point of view the Government has naturally been led to look upon tonnage admeasurement, and to see whether they or the shipping interest are justly amenable to the imputation of having thereby deliberately neglected any element which is necessary for the due safety of vessels.

It will not admit of controversy, that in the first instance, the sole question, as far as Government was concerned, was the levying of a certain per centage upon the value of goods carried in sea-going ships; and they sought to do this, by ascertaining, as nearly as they could, the number of tons weight of material so carried. Hence the origin of the term tonnage, which means, not the tons weight carried, but the tax payable upon the tons weight carried. It was, in fact, entirely a fiscal question. But in process of time, it came to be seen that, by the particular mode in which the capacity of the ship was measured, with a view to the imposition of the tax, a direct countenance was given to a bad type of ship-building, and impediments thrown in the way of improvements in naval architecture. The merchant who chose to employ ships of a good and improved form, was made, unjustly, to pay more than his proper quota to the general tax. How to obviate this injustice, to give no premium to bad and unsafe forms of ships, and at the same time to throw no impediment in the way of improvements in the noble science of naval architecture, by taxing a vessel in strict accordance with her actual capacity of carriage of cargo,—this has been the problem which, we believe, the Government has honestly and *bonâ fide* endeavoured to solve.

The Commission of 1849 recommended that the entire cubic contents of all vessels measured *externally* should be taken as the basis for determining the various charges to be made. For various reasons, this recommendation was displeasing to the ship-building interest; it seemed to give an undue advantage to iron ships, which, with a less entire cubic displacement, could carry an equal amount of goods (*admeasurement*) with wooden ships. The difficulty also of fixing upon a load-water-line as a point of departure for the measurement seemed insuperable. At all events the Government found their scheme, founded on the report of this Commission, so violently opposed, that they withdrew it, and very wisely fell back upon what was offered to them as the next best course, viz., legalizing a mode of exact *internal* admeasurement as the basis for regulating the dues. Now, let us observe, the tonnage, measurement, and registration of vessels, has never been fairly brought before Government, in any other than a purely fiscal point of view. Mr. Atherton is the first agitator that we know of who has insisted upon the scientific features of the case, and those which bear upon the dangers of the sea-voyage. And we at once profess our belief that Mr. Atherton has not made out a case of sufficient weight, and, relying upon data sufficiently established, to justify the Government in adopting his views, in any attempt to carry which into law they would undoubtedly meet with a signal defeat.

It is, at all events, satisfactory to observe, that all parties seem agreed upon this, that the new registration does rest upon an *accurate* internal measurement, and that, therefore, Government now OFFERS A PREMIUM TO NO PARTICULAR TYPE OF BUILD; that it has removed all just causes of complaint on this head. Mr. Atherton, who is not practically concerned in this part of the question, is the only person who has taken part in this discussion, who does not allow, with Mr. Scott Russell, "that the present mode of measurement is a very fair one, for fiscal purposes," and that, whatever come of any other registration, "the nominal fiscal tonnage should remain as it is." How can it be otherwise

than fair, when it is really a fixed proportional part of the actual internal available space of the ship?

We think, then, Government has succeeded very well in the only object they had in view, viz., to lay a fair tax upon vessels, leaving the ship-owner and ship-builder at liberty to adopt such type of build as they might think best without thereby incurring loss.

We now come to the consideration of other parts of this question, which Mr. Atherton has brought prominently forward. First, He tells us that, "the *capability* of a ship for carrying weight is a totally different thing from the capability of a ship for holding bulk; the one is no measure or indication of the other. A ship may be actually sunk with some descriptions of cargo before she is half full, and with other descriptions of cargo the same ship may be full before she is half loaded." He then goes on to speak of the glaring deficiency of the tonnage registration law in this respect.

Now, does Mr. Atherton really and seriously mean to say that, under the ordinary conditions of a ship being a ship and not a raft, in accordance with his very conclusive and satisfactory! *reductio-ad-absurdum* argument (by the way, to which party does the *reductio ad absurdum* in such a case really apply, the argument or the person who makes it?), there can be internal roomage without external displacement? Among all our readers, who have long dealt practically with these matters, is there one who can point to a vessel, which has a "large *capability* for carrying bulk," without a correspondingly large "capability of carrying weight?" Considering that the external and internal measurement of a ship (excluding, of course, buildings on the deck in passenger-ships, for which extra charge ought to be made) differ solely in the scantling, &c., of the materials used, we cannot conceive a vessel, whose general internal contour can differ materially in *form* from the external contour, and whose internal and external capacities do not stand to one another in some kind of ratio, depending solely on the nature of the materials of which the ship is built.

We think that it is fair, and within the experience of every practical man to assert, that ships with large internal roomage will also have a large external measurement, and conversely. Nor can we believe that cases actually occur, in practice, where a ship which is calculated to carry 1,000 tons measurement of light cargo, and which, therefore, measures according to the law 100,000 cubic feet of internal space, cannot carry 1,000 tons weight of material. If we are wrong, let us at least have the actual vessels which have played this extraordinary trick produced.

The fact is, the whole of this argument is a mere play upon words. The *necessary* connection between external and internal capacity is ingeniously kept out of sight —we will not say intentionally. Gentlemen who ride a hobby often allow that hobby sadly to run away with their judgment and discrimination, and the poor practical ship-owner is left in a sad state of bewilderment.

The uncertainty in the signification of the term tonnage, as depicted by Mr. Atherton, is a mere figment of that gentleman's brain. Tonnage is a technical legal term *defined* by law, and meaning nothing more nor less than what the law asserts. It is simply this: the number expressing the $\frac{1}{100}$th part of the actual number of cubic feet contained in the vessel, measured accurately according to fixed conditions. If Mr. Atherton chooses to perplex himself with what *historically* it may be supposed to mean, and with what, under hypothetical conditions, it may be made to mean, the fault does not lie at the door of the law, which is clear and explicit enough, but at his own, who chooses to introduce spontaneously and unnecessarily these elements of confusion.

If a ship-owner is so wanting in common sense and acumen as to allow himself to be over-reached by a long-headed ship-builder, who furnishes him with one article, while he thought he was bargaining for another, no law upon earth will protect him any more than it will the trader deficient in sense, in any other line. Of this, however, we are satisfied, that if he stipulates among his conditions for a ship whose registered tonnage shall be 1,000, the law will protect him if he does not get such an article; and if he does, he need be under no apprehension as to its capabilities of "carrying 1,000 tons of weight," or "1,000 tons measurement of light cargo, at the usual conventional measurement of forty cubic feet to a ton."

It is at this part of his argument that Mr. Atherton has made that attack on the shipping interest which has given such dire offence.

We do not think he meant to make any serious charge against the shipping interests, but with this allowance we do not think the attack called for; and besides, a very different answer may be given to the insinuation that, for private interests of their own, the ship-building interests have not petitioned to the Government against the present law. Is it *certain* that an alteration of that law, so far as measurement of tonnage is concerned, would be to

the public good? Has it been made to appear even probable by well founded arguments? What do the shipping interests gain, and what does the public lose, by continuing that law? All Mr. Atherton's indignant eloquence about public bodies not reforming themselves or petitioning for their own reform, is very fine, no doubt, but has the misfortune of being quite beside the question. What if, on the contrary, the interests in question have not petitioned Parliament for a change because that law is, as Mr. Scott Russell describes it, for fiscal purposes (and for fiscal purposes only is this portion of the law designed) the best and fairest that could be devised! What, if the shipwrecks and other horrors which would harrow Mr. Atherton's feelings again to recall, have no connection whatever with the fiscal rule for admeasurement of tonnage! Mr. Scott Russell sees no such connection; ship-owners and ship-builders see no such connection; and certainly, to the vulgar eye of the uninitiated, Mr. Atherton has made no such connection apparent.

Again, according to the principles advocated by Mr. Atherton, there ought to be a different kind of ship for the carriage of every different kind of cargo. Is it usual to build ships on this principle? is it desirable to do so? Mr. Atherton's argument can stop at nothing short of this.

Now, what is it that Mr. Atherton proposes, which the shipping interests resist as so injurious to them, and which is so much for the public good?

It is to determine in every case upon a load-water-line below which it shall be illegal to sink the vessel, and which is to be the point of departure for all measurements. Undoubtedly, it would be very desirable (if attainable) to fix such a limit to the degree to which ships may be loaded. But has it been made to appear, by arguments of any strength, and by facts, that any large proportion of our shipwrecks is caused by over-loading vessels? Are not many more to be imputed to the vessels being short-handed, to drunken or otherwise incompetent masters, carelessness, and similar causes? And how is one definite position for this line to be fixed for every ship? One vessel sails better with one trim, another with another; and even at different times, under apparently similar circumstances, the same ship requires different trims. How is this element to be taken into consideration, if one definite load-water-line is prescribed for it? Again, there is no one point on which authorities more differ than in the position of this safe load-water-line. Might not the fixing it be the introduction of that Chinese element into naval architecture which Mr. Atherton so properly deprecates? It is to mistake the functions of Government to impose on it the duty of fixing any element in the construction of ships. It best discharges its duty, when, in making its arrangements for fiscal purposes, it imposes no conditions which offer advantage to one type of ship rather than another, but leaves the naval architect free to develope his resources in this noble science to the fullest extent.

There is undoubtedly, as we have observed, a point beyond which ships cannot be safely loaded. In case of accidents, and the consequent inquiries instituted by the Board of Trade, this circumstance, proved regularly in evidence by persons conversant with these matters, should have its due weight, and remove the accident from the category of those over which the owners have no control. Let the Board of Trade have, if it so please, properly authorized officers to note and record these facts. But, until it is a matter better agreed upon among naval and ship-building authorities where the proper load-water-line is to be placed, let us hesitate before we introduce this very questionable "boon to the public," of fixing it by law.

We believe that other, and at least as efficient restraints upon the shipping interests, may be devised for checking the evils that are complained of so loudly.

(*To be continued.*)

THE CALCULATING MACHINE OF M. SCHEUTZ.

It is a misfortune for the scientific reputation of Englishmen, that they have permitted to lie and rust, unfinished, those marvellous calculating engines, the designing of which made the name of Mr. Babbage illustrious, and the partial execution of which led to the invention of those improved implements, by means of which the mechanical genius of our people has achieved its most memorable triumphs.* It is now, however, too late, in all probability, to repair the evil, and all that we can do is to hold ourselves ready to receive one day, from the hands of a foreigner, what we would not, because of our parsimony and "circumlocution," permit our own countrymen to produce for us.

* See Lord Rosse's remarks, at page 270 of our 62nd volume, No. 1650.

The preceding considerations suggested themselves to us on the introduction into this country of a machine which calculates and prints tables by differences, the invention of M. Scheutz, of Stockholm. This machine, having been exhibited at the Paris Exhibition, has also been placed before the Royal Society, which has received a Report* upon it from Professors G. Stokes, W. H. Miller, C. Wheatstone, and R. Willis. The following history of the origin and progress of this invention was laid before the Royal Society, at its last anniversary, by Mr. Babbage, who took occasion to point out, in a very unselfish and honourable spirit, the claim the ingenious Swede had upon the Society for some distinguishing token of merit and ability. The speech of Mr. Babbage was as follows;—

My Lord Wrottesley,— I beg leave to offer a few observations on the distribution of our medals,† but not with the intention of finding fault with their present allotment.

The distinguished foreigner, whose valuable discoveries you have so ably explained to us, is fully entitled to a Copley medal. I join also most cordially in the justice of the award of the first royal medal to that eminent astronomer who has organized a system for the discovery of new planets, and who has himself already added ten to their number. With the researches rewarded by the second royal medal I am entirely unacquainted; but I am willing to assume that they have been duly considered and justly rewarded.

There is, however, an instrument to which we have given hospitality during many months in these apartments, which I think highly deserving of a medal; and I had hoped that on the present occasion it might at least have been considered worthy of being placed amongst the list of candidates for that honour. I allude to the admirable machine for calculating and printing tables by differences, and producing a mould for the stereotype plates to print the computed results—an instrument we owe to the genius and persevering labour of Mr. Scheutz, of Stockholm. A committee of the Royal Society has already reported upon the machine, and I can myself bear testimony to the care and attention which our secretary bestowed upon that valuable report. But as some misapprehension exists in the public mind respecting the originality displayed in that invention, I trust that having, as is well known, given much attention to the subject, I may be permitted briefly to explain some of its principles, and thus render justice to its author.

The principle of calculation by differences is common to Mr. Scheutz's engine and to my own, and is so obviously the only principle, at once extensive in its grasp and simple in its mechanical application, that I have little doubt it will be found to have been suggested by more than one antecedent writer.

Mr. Scheutz's engine consists of two parts—the calculating and the printing; the former being again divided into two—the adding and the carrying parts.

With respect to the adding, its structure is entirely different from my own, nor does it even resemble any one of those in my drawings.

The very ingenious mechanism for carrying the tens is also quite different from my own.

The printing part will, on inspection, be pronounced altogether unlike that represented in my drawings; which, it must also be remembered, were entirely unknown to Mr. Scheutz.

The contrivance by which the computed results are conveyed to the printing apparatus, is the same in both our engines; and it is well known in the striking part of the common eight-day clock which is called "the snail."

About 1834 or 1836, Mr. Scheutz, himself a member of no academy, a Professor at no University—but simply an eminent printer at Stockholm, first learnt, through the *Edinburgh Review*, the existence of that difference-engine, a small portion of which is now placed in one of the rooms of the adjoining building.*

Unfortunately for himself, Mr. Scheutz was fascinated by the subject, and impelled by an irresistible desire to construct an engine for the same purposes. He has always avowed, in the most open and honourable manner, the origin of his idea. But his finished work contains undoubted proofs of great originality, and shows that little

* We shall endeavour to find space for this Report at a future time.

† The Copley medal of this year was awarded to M. Foucault. "M. Foucault, I present you this medal in testimony of our admiration of the skill, ingenuity, and talent displayed in your very remarkable experimental researches."—*Address of the President of the Royal Society.* The first royal medal was awarded by the Council to Mr. John Russel Hind, superintendent of the *Nautical Almanac*, for his researches and discoveries in astronomy. The second royal medal was awarded by the Council of the Royal Society to Mr. Westwood, on account of his valuable and long-continued researches in entomology.

* In the Museum of King's College.

beyond the principle could have been borrowed from my previous work. Having formed the project, Mr. Scheutz immediately began to work upon it. After four years of labour and difficulties, which cost him a large portion of his fortune, he produced the first model. This, however, did not satisfy his wishes: but, far from being disheartened, he immediately recommenced his experiments with renewed energy, expending on them all the remaining savings of an industrious life, as well as the whole of the time he could snatch from the labours on which the support of his family depended.

His son also, after completing his studies with great credit at the Technological School of Stockholm, was anxious to assist his father in this difficult task; and for that purpose abandoned the career he had previously chosen.

The father and son now worked together for several years, and at last produced a machine, in which were united all the requisite conditions of a difference-engine. But the severe economy they had been compelled to use, in the purchase of materials and tools, and probably the absence in Sweden of those precious but expensive machine-tools, which constitute the power of modern workshops, rendered this new model unsatisfactory in its operations, although perfectly correct in principle.

Exhausted by the sacrifices thus made, yet convinced that with better workmanship a more perfect instrument was within their reach, Mr. Scheutz determined to apply for assistance to the Diet of Sweden.

The Diet with difficulty consented to advance 5,000 rix-dollars (about £280), on condition that the new machine should be completed within a year, and that the Messrs. Scheutz should give a guarantee to return that sum to the State if the machine did not fully attain the objects proposed.

To the already exhausted funds of Messrs. Scheutz, this *guarantee* became a greater difficulty than the construction of the machine:—they therefore felt compelled to renounce the work. Thus would have ended, unknown and unappreciated, the vast exertions of two men of highly cultivated understanding, whose truth and simplicity of character had been amply tested by the severest labour, by the greatest sacrifices.

Fortunately, however, amongst the Professors of the Academy of Stockholm enlightened men were found, capable of sympathizing with moral and intellectual worth. To the enduring honour of the Swedish Academy a numerous list was soon formed, in which each name became responsible for that part of the amount annexed to it, and thus the State was secured from any possible loss.

Although the very limited amount thus raised was inadequate, the Messrs. Scheutz, confident in ultimate success, pledged their own credit for the further necessary advances, and after working night and day, with indefatigable industry, the last day of the allotted year saw the completion of their long-cherished hopes.

The Diet, though at first unfavourable to the invention, now granted a reward of 5,000 rix-dollars to the inventors; thus raising their total grant to 10,000 rix-dollars (about £560).

A glance at this machine will convince any competent judge that this sum must be very far from replacing the mere money expended, during a period of almost twenty years, in its contrivance and construction. But Sweden has thus secured for herself the glory of having been the first nation practically to produce a machine for calculating mathematical Tables by differences, and printing the results. Wealthier and more powerful nations will regret that the country of Berzelius should thus have anticipated them, in giving effect to an invention which requires for its perfection the tools of nations more highly advanced in mechanical science. But there is still left to them the honour of acknowledging the services of a foreigner, from which the richest and most commercial countries will derive the greatest advantage.

The machine was conveyed to Paris, and placed in the Great Exposition. The jury to which it was referred contained many distinguished names, amongst them that of M. Mathieu, Member of the Institute, who having been for a long period entrusted by the Academy of Sciences with the arduous duty of reporting upon the numerous calculating machines submitted to that learned body, was already familiar with the history of the past. Availing himself of all the printed documents, relating to former difference-engines, and studying those latest illustrations of Mr. Scheutz's machine, which had rendered visible to the eye, in one unbroken chain, the whole sequence of its minutest movements,* this eminent astronomer was in a position to pronounce with authority on the merit of the Swedish engine. That jury, after full examination, concurred with their distinguished col-

* These illustrations were made by my son, Mr. Henry Babbage, an officer of the Indian army, now on furlough in England. They consist of the complete "Mechanical Notations" of the Swedish machine, and were exhibited at the meeting of the British Association at Glasgow, and afterwards sent to Paris for the use of the jury to whom that machine was referred.—See *Phil. Trans.*, 1825, and *Comptes Rendus*, Oct. 8th, 1855, vol. xli.

league in unanimously awarding to it the gold medal.

The Emperor Napoleon, true to the inspirations of his own genius and to the policy of his dynasty, caused the Swedish engine to be deposited in the Imperial Observatory of Paris, and to be placed at the disposal of the members of the Board of Longitude.*

Your lordship is aware that previously to awarding any of our medals, each Member of the Council may place one or more names on the list of candidates whose claims are to be discussed. I regret that (perhaps through inadvertence) the name of Mr. Scheutz was not placed upon that list, and I cannot, my lord, sit down without expressing a hope that the Council of the ensuing year may more than repair the omission.

DEEP-SEA SOUNDING INSTRUMENT.

Captain T. Spratt, of H. M. Steam-vessel, *Spitfire*, who has for some time given his attention to the best means for obtaining correct soundings at great depths, and tried several appliances for this purpose, has recently submitted to the Hydrographic Department of the Admiralty the following description of a deep-sea sounding instrument, which, in his judgment, exceeds all others in ingenuity, simplicity, and neatness:

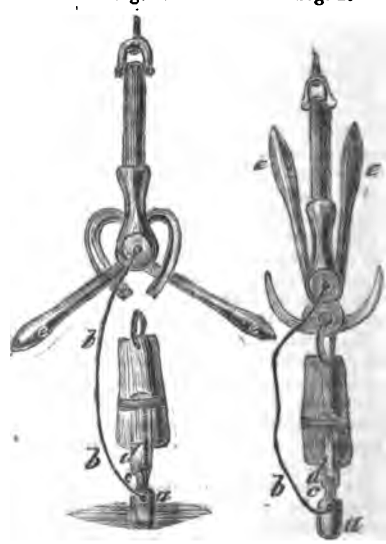
"The inventor of this new and clever instrument," says Captain Spratt, "is Carmelo Bonnici, a Maltese, and the blacksmith of the *Spitfire* since she was commissioned in 1851.

"Several other instruments for this object having been previously made by him, in the course of the past year he produced the one now recommended for a fair trial in depths and conditions that do not occur in the sea I am now employed in.† But it has answered perfectly in depths of 300 fathoms and under; and I have no doubt will answer equally well in any depth yet reached, where it is desirable for the weight to become detached on reaching the bottom, and not possible during its descent.

"The advantage it possesses over the American instrument, of a rod passed through a shot, described by Lieut. Maury, U.S.N., and which has been so generally used by Lieut. Lee, in the recent voyage of the U.S. ship *Dolphin* in the Atlantic Ocean, is obvious at first examination, viz., in its application to any kind of weight that can be slung with a simple white line becket or loop. Thus a pig of ballast, an old fire bar, or an elongated weight of any kind can be used; which, from its more rapid descent than a spherical body (a shot as used by Lieut. Lee, U.S.N.), possesses great advantages under circumstances of sounding where there is a superficial current.

"With the instrument is used a small cup or hollow cylinder *a*, containing some arming to bring up an indication of the bottom. This is fastened to the instrument by a small wire or line *b b*, and is attached by the two projecting points *c*, that act as springs to grasp the end of the weight, if sufficiently pointed, or to a piece of stick lashed to the pig of ballast or weight for the purpose as *d*.

Fig. 1. Fig. 2.



"It will be seen that the weight is taken up by the instrument by placing the arms *e e* in the position shown in fig. 1, so to open the double hook connected with the arms. And with the arms placed erect, as in fig. 2, the sinker is held by the instrument during its descent; but on reaching the bottom it becomes released through the two arms falling downwards by their gravity.

"This instrument being one that may be of great use in every survey, I trust the inventor will meet the reward his ingenuity merits, and that it may be generally adopted in all our surveying vessels.

* This fact was not stated at the meeting, as it had not then reached the author in an authentic form.

† Viz., the Black Sea.

"With this instrument and the use of a silk line I trust to be able to obtain the greatest depths that can be found in the Mediterranean or the Black Sea, — haying nearly ten years since used a silk line for depths of nearly 1,000 fathoms with great success; they being rapidly obtained, and not vitiated in any appreciable amount by the influence of local currents, or from the little friction offered, and the short time the weight is in consequence descending."

COCHRAN'S IMPROVEMENTS IN CASTING MORTARS AND CANNON.

MR. J. W. COCHRAN, of New York, whose rotating shot and shell were described and illustrated at p. 267 of our last volume,* has recently introduced into this country certain improvements in casting mortars, guns and other hollow articles, which improvements consist in so arranging the various parts of the mould in which the casting is made, that the rate at which the metal is allowed to cool, shall be under the perfect control and regulation of the founder. This is effected as follows: The inventor takes an ordinary mould, composed of suitable materials, which is to form the matrix of the casting, and encloses it in an outer casing containing a non-conducting material, such as anhydrous gypsum, whereby the escape of heat from the external surface of the mould is arrested. The core which is employed for the cavity or hollow of the casting is composed of the ordinary loam, with an admixture of gypsum, to harden it and prevent scaling, and in this also is inserted a metal core barrel without perforations, and roughened on the external surface to cause the loam to adhere to it. This core barrel is suspended from, or otherwise attached to the mould case, and leaves one or both ends open as convenience may suggest. For short castings the attachment will be sufficient at the top, and the lower end may therefore be closed or hermetically sealed, the core being kept in its place by two or three grains or stays, at or near the lower end. In the centre of the core barrel reaching nearly to the lower end is inserted a tube, which is connected with an elevated tank of water, or with a forcing pump or other engine, and a stream of water is caused to flow down this tube and to rise up through the core barrel with a velocity proportioned to the desired rate of cooling. The difference of temperature between the water and the metal casting, causes the heat contained in the latter to pass through the core, where it is rapidly absorbed by the water, which, when so heated, may be carried away through suitable channels, the temperature of the water being kept under the evaporating point. Where the casting is of great length the core barrel may be continued through the bottom of the mould to obtain a more secure fixing, and being left open may be connected with a supply tube, conveying water upward, which may be discharged in any convenient manner. The same object may be partially accomplished, though less perfectly and efficiently, by passing a current of air through the core barrel instead of water.

* No. 1676, vol. lxiii.

AUSTEN'S IMPROVED CANDLES AND NIGHT-LIGHTS.

MR. A. J. AUSTEN, of the Candle Company, Bellmont, Vauxhall, has recently patented an improvement in the manufacture of candles and night-lights, which has for its object an improvement in applying to the external surface of candles and night-lights harder or less easily fusible materials than that of which the interior is manufactured. Heretofore, when manufacturing candles with harder materials externally, it has been usual to employ such harder materials at their natural points of melting; but this is objectionable. The present improvement consists in employing a solvent with the harder or less easily fusible material used, in order to reduce the melting point, and thus to facilitate its application to candles and night-lights, the solvent quickly evaporating after the casing or external coating has been produced. It is preferred to employ a mixture of stearic acid and white wax; but other hard candle-making material may be used, combined with a solvent, when carrying out the invention. It is proposed to mix stearic acid with about five per cent. of white wax, and to dissolve these materials in a proper solvent; and it is preferred to use about half their weight of ordinary, or the methylated spirits of wine. By rapidly dipping candles made of low melting materials, or night-lights, into this solution, and withdrawing them, they will be found to be covered by a thin film of hard material, which may be immediately handled. A similar coating may also be obtained by pouring the solution of stearic acid and wax or other solutions of candle material into the ordinary moulds, and then pouring out the solution, so as to leave a thin casing of the material in the moulds, in like manner to what has before been done when using hard material in a melted state without solvent, and concluding the formation of the candles or night-lights by pouring in an inferior material, or one melting at a lower temperature.

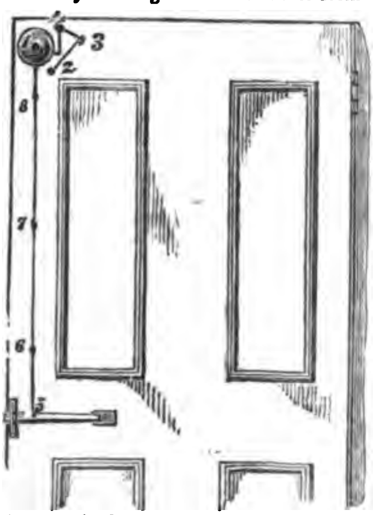
IMPROVED SHOP-DOOR BELL.

To the Editor of the Mechanics' Magazine.

SIR,—Having occasion for a bell on my shop-door, and not liking one of the old school, to tinkle at the slightest movement of the door, I inquired the price of those to give one smart loud blow, and found them to be from five to six shillings, which I considered too much. I thought that a thing might be made at a trifling cost that would answer the same purpose, and succeeded in making one at the cost of only 4d., being 3d. for the bell and 1d. for the wire. I have sent you a sketch of it, so that if you think it worth inserting in your valuable magazine, you can do so. It has been much approved of by several bell-hangers, and is, I think, capable of being much improved. I got a bit of stout iron wire (brass would do as well, and look better), and bent it round the knob of the sneck. After screwing the bell at the top of the door, and making a joint at the top at 4, I then took a short piece of wire, and bent it round the screw at 3, and put a bit of solid iron on the end at 2 for a hammer. So that lifting the sneck shoves up 4, and gives the bell a smart blow with the hammer. It has never yet failed to give the alarm, nor has gone wrong. I am, Sir, yours, &c.,

G. W. HESLOP.

Description of Engraving.—1 is a clock-bell; 2, the hammer; 3, the wire lapped round a screw; 4 are the two wires connected by bending the wire so as to form a



hinge; 5 is the sneck with the wire twisted round the knob; 6, 7, and 8 are staples through which the wire works. By raising the bell a little from the door, the wire may be made straight.—G. W. H.

Sunderland, 75, High-street.

ON THE PROSPECTS OF STEAM CULTURE.

To the Editor of the Mechanics' Magazine.

SIR,—I shall feel obliged if you will permit me, as a constant reader who values the communications of Mr. Baddeley to your Magazine, to suggest to that gentleman that, in my opinion, it will be hardly fair if he does not at once lay before you, for publication, a description of those inventions of Mr. Hart, of Wantage, which promise so much to the agriculturists of this kingdom.

At this epoch, when even the nobles of the land are not always inaccessible to the influences of the puffer, there is a tendency to undervalue, or to value suspiciously, communications which, while they ascribe great virtues to inventions, fail to exhibit the grounds on which the favourable estimate reposes. I should be sorry, indeed, to intimate, however remotely, any doubt as to the sincerity of Mr. Baddeley's praises; on the contrary, I think it meritorious in him to favour us even with the promise of good things to come; at the same time I cannot but feel that a description of Mr. Hart's invention would be acceptable to myself, and, I believe, to many others. If the invention is at present awaiting a practical trial, that is no reason why we should wait until "the next annual public meeting of the Royal Agricultural Society of England" takes place, for an account of those "improvements in the application of steam to agriculture" which have already been "*designed and patented.*"

I am, Sir, yours, &c.,

AGRICOLA.

MECHANICAL LOCOMOTION.*

To the Editor of the Mechanics' Magazine.

SIR,—Your able mathematical correspondent "W.," whose contributions are undoubtedly of a high order, has been so good as to notice my communication on the locomotive lever; but I cannot receive instruction from him; at least, concerning those realities with which practical men are conversant; on the contrary, I wish to press upon him the importance of the difference between mathematical conceptions in the abstract, and those concrete views which practice enforces as a necessity, when dealing with the actuality of things in their

* The following letter, by Mr. Cheverton, is the only one on this subject for which we can this week afford space. We have received several others, but cannot, for many reasons, allow the discussion to extend itself so far as the insertion of some of them would render necessary. Those of "W." and "C." must of necessity stand over until next week—ED. M. M.

ultimate issues, and when contemplating them as enveloped in and complicated by those collateral circumstances and influences of which science, not only for the ease but for the very possibility of investigation, is obliged to denude them. The men who can take such views of things, and yet judge of them upon the whole justly, although approximatively, and in a manner at once expansive and concentrated, are far better qualified "to aim at mechanical inventions" —and facts are ever proving it to be so— than those who have attained that "sound comprehensive grasp of the science of mechanics," which "W." thinks so indispensable, if that knowledge be only theoretical.

But to our subject. "W." asks, "In what sense do your correspondents use the word fulcrum?" This is a very pertinent question, for if it is not precisely the very point at issue, it is that which ought first to be settled; and having originated the discussion, I am entitled to determine at least the sense which I assigned to it. I gave to the term that plain meaning which it always has in practical mechanics, and so suitable to the subject locomotion, in reference to which I used it; namely, that it is the special point in the lever, from which the relation between the power and the resistance is calculated; and it is in this sense I wish it to be understood that I used the word when I asserted, as I do again, that neither rail nor water is the fulcrum of the locomotive lever, as existing in the forms of the wheel, paddle-wheel, and oar. Your mathematical correspondents, however, wish to generalise and extend the application of the term to the centre of the moments of forces; but as the three points of a lever may simultaneously be taken as the seats of as many forces; and as in this manner of viewing the subject, any one point may be taken indifferently as the centre of forces acting round it, and, consequently, as the fulcrum proper to the case, we should be left without any distinct term, referring to the special relation we wish to establish between two of the forces, under their practical aspect and designation—power and work. Practical men have appropriated the word exclusively to that purpose, and it must not be taken away from them, nor is it to be endured, that taking advantage of their own wrong, mathematicians, in right of such deprivation, should accuse them of not knowing how to use their own technical expression.

Besides, such generalising views of this mechanical problem are founded on abstract mathematical conceptions, which, though true theoretically, and even physically, in regard to the inherent nature of force, are so unreal as to the outward form and manifestation, that it sounds like a solecism to speak of three *forces* in equilibrium, in connection with power, fulcrum, and work. In the region, however, of the mathematician, the region of theory and abstraction, such language is correct; for whatever opposes force *is* force; but the practical man has a world of his own—the world of practice and of *things*; and he must have also a language of his own, which, though common at many points with that of the mathematician, must yet indicate the relations that obtain among realities as well as among abstractions. The mathematician can conceive truly enough, that the functions of the forces at the three points, or at any point of a lever, are interchangeable, and yet identically the same; but the practical man cannot indulge in any such vagaries, when he contemplates the respective mechanical appliances in which such forces are embodied. With him force is not simply force, it is a power—a power relatively to given practical effects, with its own special point upon the lever, from which it cannot wander to any other. The fulcrum is another determinate point which he cannot conceive can change offices with either of its neighbours; and least of all can he conceive that the work dône can drive the power; and yet, if things are viewed in the aspect of pure force, truth of a mathematical kind, partial and abstract, would be found to pervade the conception of such interchanges. But the practical man must deal with things in their entirety; hence the fulcrum of the mechanician is something real, and not a mere mode of conceiving things. It is determinate on its position, although it may not, as "W." says, "possess any innate mechanical property," but only an inherent practical property.* It is determinate in its position, although the acting forces *do* bear, as "J. C." truly affirms, "exactly the same relation to one another, whether the rail or the axle is regarded as the [mathematical] fulcrum of the [mathematical] lever, as every body who understands an equation of moments knows," for the centre of moments can be taken only at one place when the practical object of determining the ratio of the power to the resistance is the end in view, and that place the mechanician calls exclusively the fulcrum. It is quite correct; indeed, it is the very office of theory to generalise the moments of forces, so as to take the centre at any point whatever of the lever; but this point is usually called the

* If "W.'s" word "mechanical" were changed to mathematical, and my word "practical" to mechanical, it would be a better statement of the fact.

axis (the practical analogue is, axle), whilst the word fulcrum points to the existence of a special case, and designates that particular centre which is proper to it; and thus, in this limited sense, the word can be used mathematically as well as practically. Your correspondent "W.," does himself recognise this restricted application of the term when he says (the italics are my own), "that *in the case* of the common lever, in which *the ratio* of the power to the weight only is required, the moments are taken about *the fulcrum*." Exactly so; practical men require no other admission; the object to be obtained determines the centre and establishes the name.

But your correspondent, besides coming on our own ground, offers us battle thereon, by denying that the said ratio of power to resistance, is obtained by taking the rowlock of the boat for the centre of moments, and consequently for the fulcrum; and he sets forth his array in this order, at least so far as I am concerned.

"Calling
P the pressure on the handle of the oar.
Q the resistance of the water.
R the pressure on the rowlock.
$a+b$ the length of the oar from P to Q."
a the length of the oar from P to R.
"P $a+b$=R b."

As Q does not appear in this equation, it is taken for the fulcrum, and thus R=F the propelling force. This also is affirmed in words: "I repeat, therefore, that the ratio of the propelling force on the rowlock to the force exerted by the rower would be correctly obtained by considering the oar to be a lever of the second kind, as generally represented, by way of illustration, in mechanical books." Now I oppose this with the argument *ad absurdum*. Let $a+b$ be supposed infinite, the ratio becomes that of equality, and P=R. But according to "W.," R=F, therefore P=F. That is to say, speaking practically—let the hand of the rower slide down the oar to the rowlock, the power exerted will then be equal to the pressure upon it, and be equal also (so it is said) to the propelling force; and thus we arrive at the very same conclusion which Paddy, without the assistance of mathematical learning, by the sheer force of native wit came to, when he jumped into a boat and began pulling away at a rope fastened to the stern. We may laugh at Paddy, but we must not even smile when mathematicians perform such feats by the aid of algebraical symbols; for in such paraphernalia there is a dignity which doth hedge them round, and like the judge's wig, frowns upon and scares away any feeling like levity. The absurdity that "W.'s" statement is reduced to, arises from not taking the moments from the rowlock as the centre or fulcrum, where alone the relation between the power as a motive cause and its actions as a useful effect can be obtained. By taking them from the water, we see that in a certain position of the hand of the rower the exertion of power is useless, although, by the supposition, the lever exists, and the effect ought to be just equal to the power; but the truth is, that the lever has then no existence, and all action is spent upon and terminates within a rigid structure. The point where the fallacy lies is not in the equation determining the pressure on the rowlock, but in assuming that such pressure is the measure of the propelling force. It would be so if the oar were handled from the outside of the boat, but never having had the discomfort of being in such a predicament to remind him of the difference, your correspondent forgot, I suppose, this slight circumstance, as also the fact, that external and internal reaction are very different things.

As "W." is very particular in qualifying his statements with the condition of the motion being *uniform*, it may be as well to observe, that when locomotives come to that state, there is not, strictly speaking, any propelling force in action; they continue to move through the inertia of the motion already acquired, and the power is employed solely in overcoming resistance; for if a surplus constituting a propelling force existed, acceleration would ensue. This will be considered rank heresy in the opinion of Mr. Mushet; but that gentleman, whilst ably and enthusiastically urging others onward in the march of progress, shouting to those in the van to go recklessly ahead, is himself found retracing his steps towards the regions from which we came.

We have had under review a very curious and instructive example, illustrative of the facility with which a mathematician can come to grief, by trusting too implicitly in his symbols, and not bringing them at every distinct stage of the inquiry under the cognizance of an understanding mind. They may be allowed to take their course with a mere mechanical sort of manipulation, whilst their concatenation is a matter of necessity; but with every hiatus in and renewal of the chain of connection, it behoves the mathematician thoroughly to understand his work, or the light which the conduct of an argument by symbols is capable of throwing upon a subject, may become an *ignis fatuus* to lead him into a bog. Even Laplace could stumble on the subject of the equilibrium of Saturn's rings, and a fallacy which perhaps no mathematician could have detected, *a practical experiment* brought to light. The prestige which belongs to an array of alge-

braical symbols ought never to influence the judgment of practical men in opposition to the conclusions of good common sense, supported by observation and experience. If the disquisitions of mathematicians had been attended to, the screw propeller would never have succeeded in its struggle for existence. Many years since, a gentleman demonstrated in your papers that it must be a failure, and this he did by means of the problem of the composition and resolution of forces—a problem, by the way, which mathematicians have sadly abused in the application of it to practical matters. We even used to be taught that the crank of the steam-engine was a destroyer of power; and ruin and misery were often formerly produced by the failure of the many schemes to remedy this supposed defect. It is well to have mathematical learning, but it is better to be without if we accept it not at its true value, and know not how to make it useful. It has often, with its assuming airs, been a blind guide to practical men; and even should it cease to lead them astray, as we hope in time it may, the distrust in theory *versus* practice will ever exist, because founded on the very nature of things, and particularly on the constitution of the human mind. At the same time it must be allowed, that of late years a great deal has been done to render it more conformable to practice, and to place mathematical learning more in the subordinate and useful position of its assistant, by advancing from and working upon experimental data rather than principles. Of course my observations refer to the "mixed mathematics," for there is a higher region of pure intellect where abstraction reigns supreme.

I am, Sir, yours, &c.,
BENJAMIN CHEVERTON.

P.S.—I do not wish to prolong this controversy—indeed, I cannot conceive the probability of being required to say anything more on the subject. It is exhausted on both sides, and your readers must draw their own conclusions. But just upon closing this paper, I have received this week's publication, by which I perceive that "W.," having first generalised the meaning of the term fulcrum to make it square with mathematical abstractions, now recommends us entirely to abandon it, as "tending to confuse." This may suit the mathematicians. In practical science, however, we may not thus consult our ease, but must retain the word, and with it the practical ideas that it conventionally expresses. Now these ideas *do* refer to those same notions of work which "W." recommends us to accept as though they were novel to practical men; whereas they originated with us, and have, along with our own words, mechanical power, work and duty, been adopted by the mathematicians. In addition to the integral notion of work which "W." presents to us, *we* want to know particulars concerning its elements—we want to appreciate the respective quantities, and thence the character of the work on either side of the equation, so as to bring under our cognizance the precise change proposed to be effected in the transformation of power from cause into effect; and will "W." please to inform us how this can be ascertained, without introducing the supplementary idea of a centre or fulcrum, in reference to which the factors force and space can be measured and proportioned? B. C.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

MORE, J. *Improvements in marine and surveying compasses.* Patent dated August 30, 1855. (No. 1955.)

In order to prevent local attraction upon the needle, the inventor incloses it (except at the point of suspension and thereabouts), in pure shellac, gum shellac, sealing wax, or other gum resin, or composition of which gum resins form a part. The needle is then imbedded in cork of considerable thickness or depth, and this cork covering is covered with shellac or gum resin, as the needle itself was. In this condition the needle is suspended in the usual way. The coverings before mentioned may have others of similar character substituted for them.

STANSBURY, C. F. *An improved changeable lock.* (A communication.) Patent dated August 30 1855. (No. 1959.)

This invention consists in forming a lock with a number of tumblers so arranged that they can be worked by means of a key with changeable bits, and so that when the bolt of the lock is thrown out by a certain arrangement of bits, it can only be thrown back by the same arrangement, and yet admitting of innumerable changes of the relative positions of the bits on the key without requiring a change in the tumblers.

JUCKES, J. *Improvements in furnaces.* Patent dated August 30, 1855. (No. 1961.)

This invention, which relates to furnaces with revolving grates, consists in constructing an endless chain of parallel plates, connected at each end by bolts, and kept apart by washers or projections, and in attaching the fire-bars to this chain of plates by passing bolts through holes formed respectively in the parallel plates, and in projections on the lower sides of the bars, so that any separate bar may readily be replaced.

GOSSAGE, W. *Improvements in the manu-*

facture of carbonates of ammonia, and in the useful application of such carbonates. Patent dated August 30, 1855. (No. 1963.)

Claims.—1. The manufacture of single carbonate of ammonia in aqueous solution from ammoniacal gas and carbonic acid gas, by the employment of certain apparatus, designated an "Absorbing tower." 2. The manufacture of bicarbonate of ammonia by distillation, from aqueous solutions of sesquicarbonate, or of bi-carbonate of ammonia, and the simultaneous production of single carbonate of ammonia. 3. The application of carbonates of ammonia (obtained from ammoniacal gas and carbonic acid gas by the means described in the present specification, or by those described in that of a former patent, dated the 21st day of February, 1854), for the precipitation of carbonate of lead, of carbonate of manganese, or of carbonate of zinc from suitable salts of each of such metals. 4. The application of bicarbonate of ammonia obtained by distillation from aqueous solutions of sesquicarbonate, or of bicarbonate of ammonia) for the decomposition of common salt, and production of bicarbonate of soda and salammoniac by such decomposition.

CHARTON, P. E. *An improved metallic manometer.* Patent dated August 30, 1855. (No. 1964.)

This invention consists of a manometer, the principal feature of which is a thin diaphragm or plate of metal or other suitable substance resting upon a spiral spring capable of modifying its curves to the degree of pressure exerted.

SCHRAMM, R. *A new process for treating cotton-seed, for the purpose of, and previous to the obtaining of oil from it.* (A communication.) Patent dated August 31, 1855. (No. 1966.)

This invention consists in destroying, by means of sulphuric acid, the fibre or lint with which the cotton-seed is wrapped or coated when it comes from the cotton gin.

GEDGE, J. *Improvements in kilns, ovens, or furnaces.* (A communication.) Patent dated August 31, 1855. (No. 1967.)

This invention appears to consist mainly in combining the burning of bricks and lime with the baking of pottery, so that the former may distribute the caloric, and keep the flame from coming into contact with the latter. Also, in placing a small kiln above the larger one, and in a disposition of conduits to divide the flame.

ROSE, G. F. *Certain improvements in lithographic and copper-plate printing-presses.* Patent dated August 31, 1855. (No. 1968.)

These improvements mainly relate to a mode of working the beds of such presses backward and forward, the motive power being applied in such a way that it shall not be required to carry any weight or downward pressure, but simply to be used for propelling the bed forward and backward as required in working.

WHITE, J. *Improved machinery for cutting soap into slabs, bars, and cakes.* (A communication.) Patent dated August 31, 1855. (No. 1970.)

This invention consists in connecting the cutting wires with springs so that they shall bend and enter the soap at first at the angles, and thus work their way easily into the mass.

BUTCHER, M., and T. H. NEWEY. *An improvement or improvements in the manufacture of bobbins used in winding, twisting, and weaving fibrous substances.* Patent dated September 1, 1855. (No. 1971.)

This invention consists in moulding such bobbins from compositions consisting mainly of gutta percha.

WINFIELD, R. W., and J. JACKSON. *Improvements in metallic bedsteads and other articles of metallic furniture.* Patent dated September 1, 1855. (No. 1972.)

This invention mainly consists of the following method of connecting the horizontal rails of metallic bedsteads, and other articles of metallic furniture, with the upright pillars of the same:—Upon the pillar of the bedstead, or other article, a conical block is cast, the smallest end being uppermost. This block has two fins, which are in vertical planes, and are situated opposite each other, or inclined at any angle, to suit the angle to be given to the horizontal rails. On the ends of the horizontal rails, blocks are cast; these blocks have dovetails, which engage with the before-mentioned fins, and thereby secure the horizontal rails to the pillar. That vertical face of each block in which the dovetail is made is inclined at an angle of 45° to the rails on which it is situated, so that when the two blocks, meeting in the same pillar, are in their places, their inclined ends abut against one another; and, from the extent of bearing surface, great stability results. The invention also comprises a method of attaching one end of the sacking laths permanently to the frame of the bedstead.

CALVERT, F. C. *Improvements in the treatment of heating, puddling, and refinery iron slags or cinders.* Patent dated September 1, 1855. (No. 1975.)

It is well known that the slags or cinders above-named contain a large amount of silicious matter as well as sulphur, phosphorus, and arsenic, which very much injure the quality of the iron they contain, and the iron they come in contact with, when they are smelted with other iron ores in furnaces. By the employment of quick lime, slacked lime, carbonate of lime, limestone commonly used in blast furnaces, or magnesian limestone and the use of heat, and

after the union of such substances with the slags or cinders, Mr. Calvert smelts them not only in blast furnaces or the like places now in common use, but also in ordinary cupolas, or other suitable furnaces or places, so as to extract from them a better quality of iron than has been hitherto obtained.

AUSTEN, A. I. *An improvement in the manufacture of candles and night-lights.* Patent dated September 1, 1855. (No. 1976.)

A description of this invention appears on page 347 of this number.

PRIDEAUX, T. S. *Improvements in marine steam-boiler furnaces and flues.* Patent dated September 1, 1855. (No. 1977.)

This invention, the object of which is to reduce the temperature of the engine and boiler-rooms of steam vessels, consists in forming the doors of the smoke-boxes and flues with hollow compartments, to be filled with atmospheric air, or other imperfect conductor of heat, and in making the ash-pit doors with parallel strips or plates of sheet metal, which may be opened or closed by turning on axes, and which prevent the radiation of heat outwards without impeding the flow of air inwards.

NEWTON, A. V. *Improvements in the manufacture of gas for illumination.* (A communication.) Patent dated September 1, 1855. (No. 1979.)

This invention consists in employing peat as the source of a large bulk of highly combustible, but non-illuminative gas, and in combining with this gas a rich carbonaceous gas, derived from Trinidad or Barbadoes pitch, the solid bituminous pitch found in Nova Scotia, &c. (Prince Albert coal), and Boghead coal, thus forming an illuminative gas. The invention also comprises certain distilling apparatus for carrying out the necessary process.

SMITH, W. *An improved smoke-consuming furnace.* (A communication.) Patent dated September 1, 1855. (No. 1980.)

This invention consists in the arrangement of a double set of bars mounted on a horizontal frame which turns upon a vertical axis, and by a half revolution presents alternately one of two sets of the furnace bars for charge of fresh fuel: the more remote hearth or set of furnace bars will contain fuel in a high state of ignition, whilst the gases given off from the fresh fuel must pass through it and become consumed thereby. A perforated bridge may divide the two furnaces, extending from side to side, and permitting the gases and particles of carbon from the outer furnace, or that nearest to the front of the boiler, to pass only in the desired direction.

HEAVEN, A. *Improvements in embroidering fabrics.* Patent dated September 3, 1855. (No. 1982.)

This invention consists—1. In so working embroidering machines that the greater part of the embroidering thread is brought on to the face of the fabric, and only a small quantity on the reverse side. 2. In the application of a shuttle or other instrument to introduce a binding thread at the back of the fabric so as to secure the embroidering thread. 3. In supplying each embroidering needle with a bobbin, from which the embroidering thread is unwound as it is required, so that no time is lost in threading the needles.

HOLDEN, G. T., and H. NICHOLAS. *An improved roasting-jack.* Patent dated September 3, 1855. (No. 1983.)

This invention consists—1. In the employment of the neck tube of roasting-jacks as an axis of rotation for the key and tube, and for the ratchet and main wheels. 2. In the construction of the escape wheels of roasting-jacks, with hollow axes, for the purpose of allowing the silk to pass freely through, the pinions of the wheels being also constructed hollow for the like purpose. 3. In the arrangement of the verge so as to work horizontally, and the construction of it with an opening, to allow the silk to pass through.

LARMUTH, T. J., and J. SMITH. *Improvements in machinery or apparatus for printing.* Patent dated September 3, 1855. (No. 1984.)

This invention refers to a hand-machine for printing small surfaces, such as handbills, labels, &c. The paper or other material to be printed upon is placed upon a table, upon which is also a substance supplied with the colouring matter. Between these the printing surface is caused to alternate, and the impression is effected by means of a lever, to which it is affixed or connected.

CHANCE, J. T., and H. ADCOCK. *Improvements in casting articles of the slags produced by the smelting of iron and other ores.* Patent dated September 3, 1855. (No. 1985.)

The moulds used by the patentees are of moulders' sand, but in place of employing them in the ordinary state, they are to be gradually dried, then heated in suitable ovens up to a red heat. The fluid slag is run into them whilst they retain their high temperature, and the castings in the moulds remain for a considerable time in the ovens after the act of casting has been performed. In order to pour their contents into moulds, wrought iron vessels are used, with holes in their bottoms, provided with suitable plugs, by which means the dross, scum, or refuse remains in the vessels, whilst the more pure

melted slag runs from the lower part of the melted mass into the moulds.

JONES, E. G. *An improvement in flattening cylinders of sheet glass.* Patent dated September 3, 1855. (No. 1986.)

This invention consists in flattening such cylinders in a vertical position simply by the action of the fire, without resting them on any substance which might affect the polish of the surface of the glass. The cylinder is gradually heated in a kiln, and then carried by suitable pinchers to a carriage on a tramway, where it is allowed to partially develope itself by the heat of the kiln ; it is then pushed along to the front of a flashing furnace, by the heat of which it is brought perfectly flat. It is then detached from the pinchers, piled up in a kiln or movable apparatus, and annealed in the usual way.

ZAHN, W. H. *Improvements in machinery for making covered or plated twist and cord.* Patent dated September 3, 1855. (No. 1988.)

This invention consists of a machine, whereby certain material, as cotton, hemp, and so forth, may be covered, or as it is technically called, "plated" with silk or worsted, or any suitable fibrous or textile material may be twisted and covered, or plated with the same or a different material, and if desired, afterwards laid to make cord at one and the same operation.

HUMBY, J. *An improved machine for cutting vegetables.* Patent dated September 3, 1855. (No. 1991.)

This machine (for slicing cucumbers, onions, and other vegetables) is composed of a series of circular cutters, mounted and working in an iron or wooden frame, and having a plain roller in contact therewith, either underneath or above, the cutters and roller being connected together by means of spur gearing, and being caused to revolve by means of a handle or foot treadle. The vegetable matters are placed upon a slide or feeder in front of the cutters, by the revolution of which they are passed through the machine, and cut as required. The cut vegetable matter is cleared from the cutters and discharged into a suitable receptacle by means of a fixed comb or rack, the teeth of which pass between the circular revolving cutters.

GILBEE, W. A. *Improvements in the production of carburetted hydrogen gas.* (A communication.) Patent dated September 3, 1855. (No. 1992.)

On three coke ovens are placed nine cast iron or earthenware retorts, and between the ovens are left spaces of about four feet wide to facilitate the emptying of the upper ovens which serve for the distillation and production of coke. The lower ovens are filled with coal, and when fire is applied, the heat disengaged first heats the retorts, and afterwards passes through inclined flues into spiral flues which surround the upper ovens placed between the coke ovens, at an elevation of about eight feet. The upper ovens are made of moulded earthenware, or of cast iron coated inside and outside with fire-clay.

GOLDING, G. H. *A tool or apparatus to be used in the blocking and lasting of leather, and in other cases where a covering is required to be drawn over a solid substance.* Patent dated September 3, 1855. (No. 1993.)

A full description of this invention was given on page 294 of our Number for 29th March last, (No. 1703.)

GOLDING, G. H., and T. PAINE. *Improvements in the manufacture of boots, shoes, clogs, and other like coverings for the feet.* Patent dated September 3, 1855. (No. 1994.)

This invention consists in forming the under sole and seat of the heel in one piece, and in so forming the heel that it may be easily adjusted in the seat while from the construction and fitting thereof it may be readily removed, repaired, and refitted, or a new one substituted in lieu thereof. Where desired passages or grooves are formed on the inner top surface which communicate with the atmosphere and through perforations in the inner sole with the foot, the patentees stamp or otherwise form from leather, gutta percha, or other material suitable for the under sole of boots and other like articles a piece which forms the sole, waist, and seat for the heel. This seat is hollow in the centre and is formed on the inside with a sunk flange or rim for the reception of the heel which is constructed as follows: 1st. They take a circular metal disc with a collar screw threaded on the outside, the collar hangs down at right angles or nearly so from the under side of the disc, and the space between the outside of the collar and outer and under edge of the disc, forms a rim, which rests upon and is free to turn round in the flange on the inside of the heel seat; they next screw on a leather or other suitable heel piece over the screw thread on the collar, and secure it by a pin which passes through the leather and collar. On taking out this pin the leather or other heel piece can be removed from the metal collar and a fresh one may be screwed on.

CLARK, C. and J. CLARK. *An improvement in the manufacture of boots and shoes.* Patent dated September 4, 1855. (No. 1995.)

This invention consists in combining

a golosh or over-shoe of India-rubber, gutta-percha, or other material, with a boot or shoe, either manufactured in the ordinary manner, or without a sole, or manufactured in such manner as to form a fixed lining to the golosh or over-shoe, in place of making the latter separate from the boot or shoe, as heretofore.

WOODCOCK, W., T. BLACKBURN, and J. SMALLEY. *Improvements in the pistons of steam-engines, which improvements are also applicable to pump-buckets.* Patent dated September 4, 1855. (No. 1996.)

The object of this invention is to construct the metallic rings or packings of pistons and pump-buckets so that they shall be pressed against their cylinders or barrels by the steam or water acting against their internal surfaces, and against the bodies or shells of the pistons or buckets.

JAMES, W. H. *Improvements in steam-engines.* Patent dated September 4, 1855. (No. 1998.)

A description of this invention will be given hereafter.

CONIAM, T. T. *Improvements in tiles for roofing.* Patent dated September 4, 1855. (No. 1999.)

This invention consists in making tiles with edges turned up on three sides, so as to lock into each other.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GEDGE, J. *Improvements in the manufacture of casks or barrels.* (A communication.) Application dated August 30, 1855. (No. 1957.)

It is proposed for the purpose of heading puncheons, hogsheads, or other casks, to use an apparatus which takes up and firmly holds together all the pieces comprising what is technically termed the heading. On a plane or scale are placed two cramp irons, one of them being movable; the parts are gathered together, and secured by a vice. This effected, with two screws the wood is firmly secured to the scale or plane aforesaid; the circle is then struck in the usual manner, and by a single saw-cut the head is formed.

STANSBURY, C. F. *An improved plane-iron.* (A communication.) Application dated August 30, 1855. (No. 1958.)

This invention consists in forming a plane-iron, by placing between iron plates, of the shape of those which form the ordinary double plane-iron, a steel plate, which may be advanced or drawn back, and fixed in any desired position, by means of screws or a single set screw.

STANSBURY, C. F. *A machine for splitting leather and for analogous purposes.* (A communication.) Application dated August 30, 1855. (No. 1960.)

This invention consists—1. Of a disc cutter, having a simultaneous rotary and reciprocating movement relative to the machine in a plane at right angles to the axis of rotation for producing a "drawing cut." 2. Of certain devices for feeding or drawing the leather and confining it in close contact with a gauge bed or bar, viz., an endless apron, passing over an elevated bed and rollers, combined with another roller, having a greater surface speed than that of the apron. 3. Of certain devices for obtaining an increased feed or draft, for the purpose of drawing out the puckers which exist in sides of leather, or which may be caused by the operation of the machine, viz., a draft roller so constructed that it shall have a greater surface speed in some portions of it than in others.

JENNINGS, H. C. *An improved compound or medicine for cholera and diarrhœa.* Application dated August 30, 1855. (No. 1962.)

This medicine consists of a combination of anhydrous acetate of ammonia; tinctura opii; tinctura guava ammoniata; creta preparata; æther, sulphuric; essential oil menthæ piperatæ; and syrupus simplex.

PALMER, W. R. *Improvements in writing desks, which can be used in the dark, or after a person has retired for the night, or by the blind, or those with weak eyesight.* Application dated August 31, 1855. (No. 1965.)

The inventor constructs a box about 10 inches long, 6 wide, and 3 deep. The top, for about half its length, is hinged at the end so as to be elevated, and underneath it is a cylinder on which is wound a continuous sheet of paper, which as it is unwound passes up over the unhinged portion of the top which forms a writing tablet, and then between two cylinders worked by a finger-wheel. The unwinding of the paper is regulated by a pawl which falls into this wheel.

DODDS, T. *Improvements in the construction of an apparatus for heating all kinds of furnaces with coal or other gases.* Application dated September 1, 1855. (No. 1973.)

The inventor describes certain arrangements for heating furnaces with gases, which cannot well be described without illustrative drawings.

JOB, A. M., and E. TOMLINSON. *A new article to be called "India-rubber leather cloth," applicable to covering roofs, floors, trunks, and for other similar purposes.* Application dated September 1, 1855. (No. 1974.)

This invention comprises—1. The combining of particles of leather with masticated

India-rubber, or gutta percha or with both; also, the mixing of metal-dust or filings with masticated India-rubber or gutta percha, by means of mastication or by roller pressure; the softening of the India-rubber or gutta percha to cause the adhesion of such dust so prepared by any of the well-known solvents. 2. The printing and colouring the mixture according to the taste of the manufacturer, either by means of blocks or cylinders. 3. Its application when manufactured to all purposes for which it may be found useful.

BENTLEY, T. *Improvements in apparatus for heating water or other fluids by gas.* Application dated September 1, 1855. (No. 1978.)

The inventor constructs a portable apparatus in such manner that it may be immersed in the fluid to be heated, and when the desired heat has been obtained be removed. For this purpose a gas burner is fixed in a vessel, by preference of a conical form at its lower parts, and closed at the bottom, having a descending tube to convey air to the burner, and an ascending tube or chimney to carry off the products of combustion. Those parts are made of such a height as to be greater than the depth of water or fluid to be heated. The gas is supplied to the burner by an India-rubber or other flexible tube. When such apparatus is to be used, the gas is to be lighted, and the apparatus is to be immersed in the water or fluid, and retained immersed (by being weighted) till the desired temperature has been attained.

M'LIESH, W. *Improvements in steam-boiler and other furnaces and in the prevention of smoke.* Application dated September 3, 1855. (No. 1981.)

In applying this invention to internally flued boilers in which the furnace is at one end of the main internal flue, a bridge or archway is built over the front portion of the grate bars, extending backwards a suitable distance over the furnace. This archway is built so as to leave a thin or narrow space between itself and the inside of the boiler-flue, through which space air is admitted from the front, in such a manner as to cover or envelop the furnace flames in the form of a thin sheet, as it issues into the furnace space at the back end of the archway, being heated by the archway in its passage over it.

SY, E. *A new method of obtaining motive power.* Application dated September 3, 1855. (No. 1987.)

This invention consists of an attempt to convert into motive power the upward pressure exerted by a fluid upon a body immersed in it, by means of a number of hollow cylinders, contained in a hollow roller, and carried by a wheel.

FLYNN, H. E. *Making connections between and adapting appliances to locomotives and all descriptions of railway carriages, whereby the possibility of accidents resulting from the breakage or dislocation of their wheels or axles is prevented or the chances thereof greatly diminished.* Application dated September 3, 1855. (No. 1989.)

This invention consists in uniting the locomotives and several carriages of a train by means of hollow cylindrical or socket buffers and counter cone-headed spindle buffers, so that with ordinary couplings perfect support and reciprocal action on the several carriages is obtained, preventing, in the event of breakage or dislocation of wheels or axles, their falling over, &c. The appliances consist of a solid flat bar of iron, fastened athwart the under-surface of the frame, and having its ends bent at right angles, or nearly so, down to the axles, and having hinged thereto a loose iron collar which encloses the axle, leaving a space all round, and without, in any part, touching or interfering with the axle until accident calls it into play, to support or retain the axle in or near its proper position.

FLYNN, H. E. *Making signal communications between the guards and drivers of railway trains in transitu, and also in cases of accidents, making cautionary signals to trains approaching either from before or behind.* Application dated September 3, 1855. (No. 1990.)

"This invention consists in fixing in front, and facing the engine driver and stoker, or in other suitable position, without impeding the forward view, an adjustible mirror or reflector of a one or more sided plane, flat, or other surface, on which plane or planes fall or strike, and are reflected, the rays from a powerful lamp so placed on the guard's carriage or in other proper position, so as to be capable of throwing on the driver's mirror or mirrors, preconcerted or conventionally agreed on coloured or non-coloured lights."

TAYLOR, J. G. *Improvements in coating, covering, or plating metallic surfaces.* Application dated September 4, 1855. (No. 1997.)

This invention consists in the application of aluminium, either by galvanic action or by the old method of plating with sheets, as a coating for metallic surfaces.

FOSTER, D. G. *Improved means of supporting or training plants.* Application dated September 4, 1855. (No. 2,000.)

The inventor constructs a metallic tripod or stand, in the centre of which an iron rod is secured. On this rod sliding pieces move, having at their extremities two holes which receive the ends of a metal ring which encircles the plant. The sliding pieces may be keyed at different heights.

PROVISIONAL PROTECTIONS.

Dated December 22, 1855.

2899. John Gedge, of Wellington-street South, Strand, Middlesex. Improvements in cutting and folding paper to form letters or notes and envelopes in one piece. A communication from Guillaume Pierre, of Clichy la Garenne, in the Empire of France.

Dated February 14, 1856.

377. John Conrad Meyer, of Paris, France, civil engineer. Improvements in machinery for rolling metal.

Dated February 27, 1856.

501. William Holden Jennings, of Birmingham, Warwick, manufacturer. An improvement or improvements in the manufacture of the guards and heel plates of guns, which improvement or improvements may also be applied to the manufacture of lasso rings and manillas.

Dated March 1, 1856.

537. François Rualem, of Rue de Paris à Belleville, France, milkman. An improvement in the manufacture of fuel.

Dated March 4, 1856.

550. Charles Thomas Rosenberg, of Clarence-terrace, Camberwell New-road. Improvements in ornamenting china, glass, and other surfaces, when transferring printed impressions.

Dated March 17, 1856.

634. George Hills, of Belmont-hill, Lee, Kent. Improvements in treating fatty and oily substances so as to obtain stearine and oleine in separate states.

636. James Amos, of Frindsbury, Kent. An improved flour dressing machine.

638. Robert Thomson, of Glasgow, Lanark, manager. Improvements in weaving.

Dated March 18, 1856.

640. Peter Armand Lecomte de Fontainemoreau, of Rue de l'Echiquier, Paris, France. Improvements in churns. A communication.

642. Thomas Bird, of Manchester, Lancaster, engineer, and Thomas Rose, of the same place, engineer. Certain improvements in castors.

644. Edwin Pettitt, of Manchester, Lancaster. Improvements in machinery for preparing cotton and other fibrous substances.

648. William Smith, of Salisbury-street, Adelphi. Improvements in the means of economising heat in locomotive engines. A communication from Auguste Quanonne, of Tournay, Belgium.

Dated March 19, 1856.

651. Richard Morgan, of Acton, Middlesex, gentleman. A cellular purse.

652. Thomas Richardson of Hartlepool, Durham, engineer, and George William Jaffreys, engineer, of Hartlepool, Durham. Improvements in marine steam engines.

653. Augustus Dacre Lacy, of Hall House, Knayton, near Thirsk, Yorkshire, gentleman. Improvements in certain apparatus for taking up and delivering mail bags and other packages from a railway carriage or carriages whilst the train is in motion.

654. Barnet Solomon Cohen, of Magdalen-row, Great Prescot-street, Middlesex. An improvement in the manufacture of chimney-pieces, shop-fronts, pillars, pilasters, slabs, vases, and ornamental parts of buildings.

655. John Davie Morries Stirling, esq., of Black-grange, Clackmannanshire, North Britain. Improvements in steel and its manufacture.

656. Barnet Solomon Cohen, of Magdalen-row, Great Prescot-street, Middlesex. An improvement in the manufacture of penholders, handles, knobs, finger-plates, and umbrella and parasol furniture.

657. Ely Smith Stott, of Halifax, woollen manufacturer. Improvements in the manufacture of mohair, alpaca, and worsted pile fabrics.

658. David Cope, of Birmingham, Warwick, manufacturer. A new or improved manufacture of spoons, forks, and ladles.

659. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improved means for separating substances of different specific gravities. A communication.

660. John Bishop Hall, of New York, United States. Improvements in preparing and treating pictures.

661. Charles Frederick Parsons, of Lambeth, Surrey, engineer. Machinery to be employed in the bleaching and dyeing of cloths, yarns, and fabrics.

662. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in balance slide valves. A communication.

Dated March 20, 1856.

663. John Leighton, of Brewer-street, Golden-square, Middlesex. A luminous fire-place and self-supplying smoke-consumer.

664. Peter Armand Lecomte de Fontainemoreau, of South-street, Finsbury, London. Improvements in looms for weaving. A communication.

665. James Wadsworth, of Hazelgrove, near Stockport, Chester, machine-maker. Improvements in the ventilation of mines, or in the means of removing noxious gases therefrom, and in machinery or apparatus to be used for that purpose.

666. John Watson Burton, of Eye, and George Pye, of Ipswich, Suffolk, flax manufacturers. Improvements in treating flax, hemp, and other fibrous matters requiring like treatment.

667. William Charles Theodore Schaeffer, of Bradford, York. An improvement in treating soap-suds and wash-waters.

668. John Davie Morries Stirling, esq., of Black-grange, Clackmannanshire, North Britain. Improvements in mounting heavy ordnance for naval purposes. A communication from M. Delvigne, of Paris.

669. John Trueman, of Castle-street, Belfast, Ireland, baker and confectioner. Improvements in ovens for baking.

670. William Drummond, of Smith-street, King's-road, Chelsea, Middlesex, surveyor. Improvements in spring hinges for swing doors.

Dated March 22, 1856.

671. James Murphy, of Newport, Monmouth, civil engineer. Improvements in means or apparatus for stopping or retarding vehicles used on rail or other roads, which improvements are also applicable to the brake wheels in connection with stationary engines.

672. George Henry Brookes, of Dalkeith, Edinburgh. Improvements in stoves, grates, or fire-places.

673. William Brierley and James Platts Brierley, of Cleckheaton, York, machine-makers. Improvements in looms for weaving.

674. Walter Glover, of Salford, near Manchester, Lancaster, dyer and finisher. Improvements in the construction and arrangement of machinery or apparatus for damping and beetling woven fabrics.

675. Henry Pratt, engineer, of Worcester. Certain improvements in the construction of union mills, and in the application of the motive-power apparatus, and machinery connected with the manufacture of flour and bread, parts of which are also applicable for other useful purposes.

676. James Septimus Cockings, civil engineer, of Ann-street, Birmingham, Warwick. An improved envelope, and which said envelope he proposes designating as the despatch or return envelope.

677. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in weaving by electric power, and in the machinery or apparatus employed therein. A communication from M. Louis Bolmida Bauker, President of the Electro Weaving Company, at Turin, Sardinia.

678. John Jones and Alexander Cunningham Shirreff, of Glasgow, Lanark, North Britain, engineers. Improvements in the construction and application of rotatory motive-power engines and pumps.

679. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in electro-magnetic printing telegraphs. A communication from Charles Claude Etienne Minie, Commandant of the School of Fire-arms at Vincennes, France, and Louis François Clement Breguet, of Paris, France.

680. Henry Brierly, of Chorley, Lancaster, machinist. Improvements in self-acting mules for spinning and doubling.

681. John Hinks and George Wells, of Birmingham, Warwick, manufacturers and copartners. Improvements in metallic pens and penholders.

682. Gustav Georg Anton Ludwig Michael Schelhorn, of Birmingham, Warwick, merchant and manufacturer. A new or improved penholder.

683. Charles Carey, of Union-grove, Wandsworth-road, Surrey. Improvements in shower-baths.

685. Charles Carey, of Union-grove, Wandsworth-road, Surrey. Improvements in the vessels and filters used for making infusions of coffee and other substances.

686. John Juckes, of Dame-street, Islington. Improvements in furnace-bars.

687. Charles Carey, of Union-grove, Wandsworth-road, Surrey. Improvements in presses for copying letters and other documents, and for other uses.

688. Edmund Barber, of Tring, Hertfordshire. Improvements in mangles.

Dated March 24, 1856.

690. Thomas Heaton, of Blackburn, Lancaster, engineer. Improvements in self-acting doors and gateways.

691. James Bryant the younger, of Plymouth, Devon, sugar-refiner. Improvements in machinery or apparatus for the re-burning of animal charcoal.

692. James Robertson, of Ardrossan, Ayr, N. B., engineer. Improvements in transmitting motive power.

694. Peter Brown, of Liverpool, Lancaster, corn merchant, and George Brown, of the same place, corn merchant. An improved ash-pan for fire-grates.

695. Richard Husband, of Manchester, Lancaster, hat-manufacturer. Certain improvements in the manufacture of hats.

696. John Tysoe, Charles Tysoe, cotton-spinners and manufacturers, and Peter Foxcroft, manager, of Salford, Lancaster. Certain improvements in machinery or apparatus for roving, spinning, and doubling cotton and other fibrous substances.

697. William Pitt and Edwin Turner Davies, of Birmingham, Warwick, brass-founders. Improvements in the manufacture of brackets and castors for furniture.

698. William Clay, of Liverpool, Lancaster, iron-merchant. Improvements in the manufacture of wrought or bar iron.

699. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. An improved coupling for connecting carriages, locomotives, and all vehicles used on railways. A communication.

700. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Certain improvements in cranes. A communication.

Dated March 25, 1856.

701. Robert Caunce, of Bolton-le-Moors, Lancaster, manager. Improvements in the machines for spinning called mules.

703. Louis Antoine Gisard, of Rue de l'Echiquier, Paris, France. Improvements in elastic mattresses and cushions.

705. William Foster, of Black Dike Mills, Bradford, York, spinner and manufacturer. Improvements in looms for weaving.

707. John Dearman Dunnicliffe, of Nottingham, lace-manufacturer, and Stephen Bates, of Radford, Nottingham, machinist. Improvements in the manufacture of twist lace and weavings.

709. James Hargraves, of the Woollen Works, Carlisle, Cumberland. Improvements in the apparatus used for dyeing fabrics.

711. William Ball, of Chicopee, Hampden, Massachusetts, United States. Improvements in machinery for stamping ores.

713. William Illingworth, of Manchester, Lancaster, gentleman. Certain improvements in printing or colouring china, earthenware, or other ceramic manufactures, and in the machinery or apparatus connected therewith, and also improvements in the subsequent treatment of such manufactures.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

739. Constant Jouffroy Duméry, of Paris, in the Empire of France. Improvements in smoke-preventing apparatus. March 27, 1856.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," April* 8*th*, 1856.)

2652. Juliana Martin. An improved self-acting incubator.

2700. John Ramsbottom and John Charles Dickinson. Improvements in machinery or apparatus for measuring and registering water and other fluids, and obtaining motive power from the same.

2704. Richard Hancock. Cleaning and separating ores of every description when brought into a state of low pulverization.

2710. John Gardner. A method of treating tea for economizing its use and transport.

2713. William Augustus Woodley. Improvements in the manufacture of paper bags.

2714. George Harrison and William Mitchell the younger. Improvements in machinery for roving, spinning, and winding worsted, cotton, and other fibrous materials.

2715. David Anderson. Improvements in machinery or apparatus for the preparation or manufacture of felt and other fibrous materials.

2721. Alexander Watt. An improvement in coating iron and steel with zinc.

2725. William Hartcliffe. Certain improvements in weighting the top rollers of machinery used in preparing and spinning cotton and other fibrous materials.

2732. John Moffat. An improvement or improvements in the manufacture of metallic spoons, forks, and ladles.

2735. Thomas Mara Fell. An improved ships' cooking and distilling apparatus, and improvements for the production of fresh water from sea or salt water.

2741. Jonas Marland and Samuel Marland. Certain improvements in power looms.

2745. Arthur Paget. Improvements in machinery or apparatus for the manufacture of looped or other fabrics.

2755. Angier March Perkins. Improvements in apparatus for generating steam.

2756. Frederic Samson Thomas and William Evans Tilley. Improvements in producing aluminium and its alloys, and in plating or coating metals with aluminium and alloys composed of aluminium and other metals.

2757. Angier March Perkins. Improvements in warming buildings and apartments by hot water.

2772. Joseph Hacking. Improvements in machinery for supplying fuel and air to furnaces.

2782. Thomas Heppleston and John Hunter. Certain improvements in machinery or apparatus for stretching and finishing yarns or threads.

2845. Charles Bracegirdle. Improvements in the manufacture of bolting cloths employed in dressing flour.

2870. George Ross and Thomas Wilkes. New or improved machinery for the manufacture of bolts, rivets, spikes, screw-blanks, screws, nuts for screws, and washers.

2918. Alexandre Tolhausen. Certain improvements in railway axle boxes. A communication.

2932. John Grist. Improvements in machinery for the manufacture of staves and parts of casks, and for forming them into casks, barrels, and other like vessels.

2940. Henry George Baily. Improvements in machinery for digging and forking land.

28. Charles Marsden. Improvements in the ventilation of sewers, tunnels, mines, and other confined places.

99. Adolf Pollak. Treating waste oily matters to obtain a product applicable to the manufacture of soap and other useful purposes in the arts.

276. Charles Robert Moate. An improvement in securing and sustaining the rails of railways.

279. Andrew Lamb and John Ronalds. An improvement in the construction of iron ships, boats, and other similar structures.

286. Charles Catherine Joubert and Leon André Bordier. Improvements in motive power engines.

355. Thomas Steven. Improvements in the construction of open and close stoves, which improvements are applicable in part to kitchen ranges and boiler fire-places.

390. Edouard Deiss. A method or methods of and apparatus for extracting oils, fats, greases, and resins from bones, raw wool, seeds, and other substances containing the same, and recovering a certain agent employed in the process.

475. Bennett Johns Heywood. An improved holder for leads, slate, and other marking materials, applicable also as a case for other articles.

476. Frederick Kersey. An improvement in the manufacture of drain pipes.

541. Julius Homan. An improved mode of driving sewing machines.

563. Richard Philp. Improvements in paddle-wheels for propelling vessels in water.

565. Robert Morrison. Improvements in pile driving machinery.

609. George Rees. An improved method of producing figured or ornamental surfaces on glass.

619. William Yates. An improvement in furnaces.

621. William Edward Newton. Improved machinery for separating gold and other metals from their ores. A communication.

626. Robert Walter Winfield, John Simms, and Thomas Lloyd. Improvements in the construction and ornamentation of metallic bedsteads, and other articles of metallic furniture.

628. Joseph Dumas. An improved description of tile. A communication.

631. Charles Randolph and John Elder. Improvements in marine engines.

634. George Hills. Improvements in treating fatty and oily substances so as to obtain stearine and oleine in separate states.

635. Robert Thomson. Improvements in weaving.

655. John Davie Morries Stirling. Improvements in steel and its manufacture.

657. Ely Smith Stott. Improvements in the manufacture of mohair, alpaca, and worsted pile fabrics.

658. David Cope. A new or improved manufacture of spoons, forks, and ladles.

660. John Bishop Hall. Improvements in preparing and treating pictures.

662. Richard Archibald Brooman. Improvements in balance slide-valves. A communication.

677. John Henry Johnson. Improvements in weaving by electric power, and in the machinery or apparatus employed therein. A communication.

678. John Jones and Alexander Cunningham Shirreff. Improvements in the construction and application of rotatory motive-power engines and pumps.

701. Robert Caunce. Improvements in the machines for spinning called mules.

705. William Foster. Improvements in looms for weaving.

711. William Ball. Improvements in machinery for stamping ores.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

801. William Walker.
804. Charles May.
826. Henry Alfred Jowett.
839. Robert Pattison Clark.
842. Christopher Nickels.
852. George Herbert.
853. Joshua Farrar.
872. Richard Archibald Brooman.
880. François Felix Verdié.
887. George Elliot and William Russell.
1020. James Andrew Bruce.
1161. George Bower.

LIST OF SEALED PATENTS.

Sealed April 1, 1856.

2617. Edward Orange Wildman Whitehouse.
2688. Charles Jean Baptiste Barbier.
37. Joseph Wright.
67. Frederick Albert Gatty.
92. Harry Emanuel.
101. Nathaniel Shattswell Dodge.
141. Nathaniel Shattswell Dodge.
194. David Fisher.
251. Alfred Vincent Newton.

Sealed 4th April, 1856.

2230. Thomas Dickens.
2242. John Hubbard.
2250. Joseph Gilbert Martien.

2268. Denis Hébert.
2282. Thomas Moore.
2318. Jules Hyppolite Clément.
2334. John Wakefield.
2340. John Davie Morries Stirling.
2354. Thomas Valentine, and Daniel Foster, and Giles Haworth.
2400. John Davie Morries Stirling.
2642. John Pursloe Fisher.
2662. George Edward Dering.
2795. John Horsley.
2797. John Henry Johnson.
2886. Louis Rudolph Bodmer.
2910. Frederic Holdway.
288. John O'Meara Beamish.
312. Francis Montgomery Jennings.

Sealed 8*th April*, 1856.

2266. Thomas Oddie, William Lancaster, and John Lancaster.
2274. William Bayley and John Quarmby.
2306. Enrico Angelo Ludovico Negretti and Joseph Warren Zambra.
2308. George Thomson.
114. William Prangley.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

We hope none of our Correspondents will feel disappointed on finding that their letters on "Mechanical Locomotion" are not inserted. The number received is so disproportionate to our space that many are of necessity excluded. As we do not intend the present controversy to proceed to the same length as the recent one on the "Moon's Motion" (which is now transferred to the columns of the *Times*), we are obliged to reject many communications respecting it, particularly as the principal disputants require considerable space.

Accumulator.—The address you require is, we believe, R. E. Hodges, 44, Southampton-row, Russell-square, London.

The Inventor of Gardner's Smoke-consuming Furnace.—We are compelled to postpone the insertion of your letter.

H. Broadstadt.—Yours is received, and will probably be inserted.

C. J. Recordon and *D. Mushet.*—Our first notice will explain the non-appearance of your communications.

CONTENTS OF THIS NUMBER.

Fairbairn's Improved Pumping Engine (*with engravings*) 338
Merchant Shipping Registration Act 340
The Calculating Machine of M. Scheutz 343
Deep-sea Sounding Instrument 346
Cochran's Improvements in Casting Mortars and Cannon 347
Austen's Improved Candles and Night-lights. 347
Improved Shop-door Bell 348
On the Prospects of Steam Culture 348
Mechanical Locomotion 348
Specifications of Patents recently Filed:
More ....Compasses 351
Stansbury....Changeable Lock 351
Juckes ....Furnaces 351
Gossage....Carbonates 351
Charton ....Manometer 352
Schramm ....Treating Seeds 352
Gedge....Kilns, Ovens, &c. 352
Rose ....Printing 352
White ....Cutting Soap 352
Butcher & Newey ...Bobbins.... 352
Winfield & Jackson..Bedsteads.... 352
Calvert ....Treating Iron Slags. 352
Austen ....Candles 353
Prideaux ....Furnaces 353
Newton ....Gas.... 353
Smith ....Furnace 353
Heaven ....Embroidering 353
Holden & Nicholas...Roasting Jack.... 353
Larmuth & Smith ...Printing 353
Chance & Adcock ...Iron-slag Articles 353
Jones ....Flattening Glass.... 354
Zahn ....Making Cord 354
Humby ....Cutting Vegetables.. 354
Gilbee....Gas.... 354
Golding....Blocking Leather 354
Golding and Paine ...Boots, &c..... 354
Clark and Clark ....Boots, &c..... 354
Woodcock, Blackburn, & Smalley...Pistons 355
James....Steam Engines 355
Conism ....Tiles 355
Provisional Specifications not proceeded with:
Gedge....Casks 355
Stansbury....Plane Irons 355
Stansbury....Splitting Leather 355
Jennings ....Medicine 355
Palmer ....Writing Desks.... 355
Dodds....Heating Furnaces 355
Job and Tomlinson...India-rubber Cloth .. 355
Bentley ....Heating Water 356
M'Liesh ....Furnaces 356
Sy....Motive Power.... 356
Flynn....Railway Connections 356
Flynn....Railway Signals 356
Taylor....Coating.... 356
Foster....Training Plants 356
Provisional Protections.... 357
Patent Applied for with Complete Specification 358
Notices of Intention to Proceed.... 358
Patents on which the Third Year's Stamp-Duty has been Paid 359
List of Sealed Patents 359
Notices to Correspondents 360

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1706.] SATURDAY, APRIL 19, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

BAKER'S PATENT METHOD OF SUSPENDING BELLS.

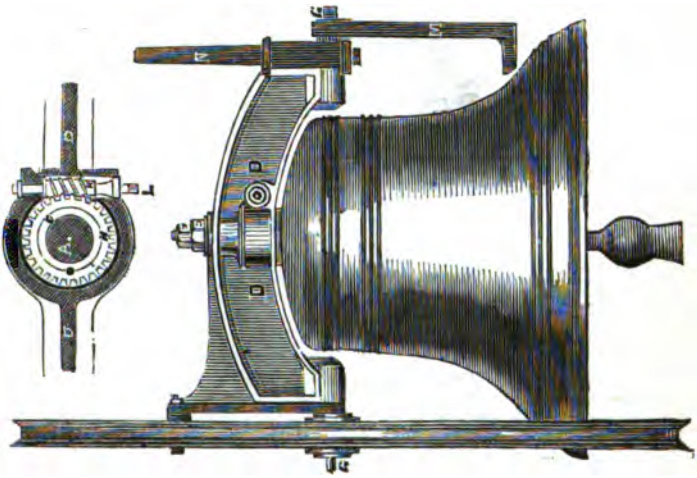


Fig. 3.

Fig. 1.

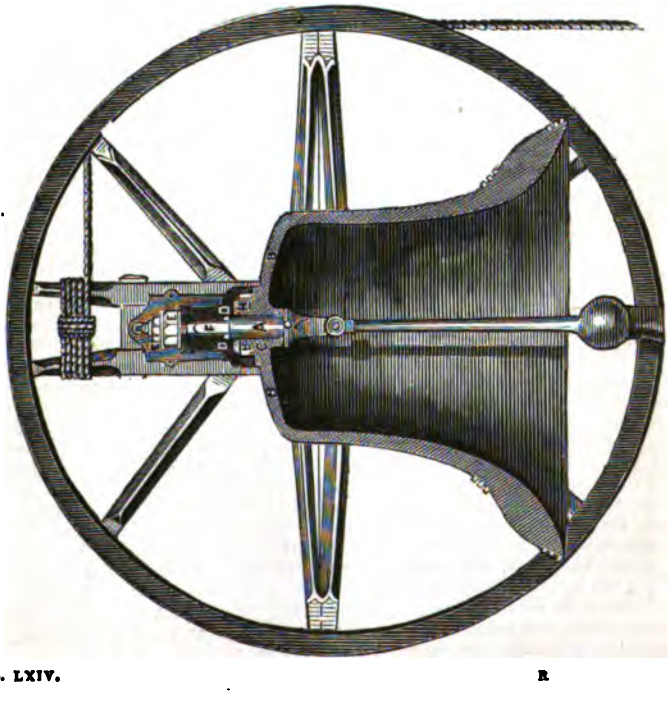


Fig. 2.

ON LARGE BELLS, AND BELL MACHINERY.

A series of very useful and entertaining papers on large bells and bell machinery, followed by discussions of much importance, has been brought before the Royal Institute of British Architects during the past and the present year. As several improvements in the methods of hanging and ringing bells have been introduced therein, we propose laying before our readers a few articles which shall embody all the most important and interesting portions of those papers and discussions. We begin with

A DESCRIPTION OF SOME ALTERATIONS IN BELLS, AND BELL MACHINERY,

BY W. L. BAKER, C.E.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, March 5, 1855.

The alterations to be described were planned for the purpose of improving, and not of radically changing the existing system of bell mechanism; they are not intended to supersede the athletic exercise of bell-ringing, but to furnish the ringer with a more perfect instrument. They will at the same time render bells much more durable, simplify their gear, and render it more impervious to the inroads of time and weather, and less liable to derangement. Before entering upon the particulars of my plan, it will be necessary to describe the principal features and details of the ordinary system of bell machinery, and the manner in which a bell is rung.

A bell hung in the ordinary way for ringing is suspended from, and firmly secured to a wooden beam called the stock, by means of long iron links; the lower ends of these links are attached to ears technically called cannons, cast on the crown of the bell, or to cross-bars passing through the eyes of the cannons; the upper ends of the links, which are screwed, are passed through iron clamp plates bedded on the top of the stock, and are secured by nuts which are screwed with the aid of a spanner down to the clamps, until the tops of the cannons are pressed firmly up into a recess cut in the under side of the stock, so as exactly to fit their shape. The length of the stock is generally about two or three inches more than the diameter of the mouth of the bell, in order to give clearance between the skirt of the bell and the framing. At each end of the stock, and at the lower part of it, is fixed a pivot or gudgeon, which rests and turns in a brass bearing fixed in the framing. A large rigger wheel is attached to the stock, and by means of a rope connected with a particular part of the periphery of this wheel, a ringer is able to put the bell into a state of oscillation. After a few primary impulses a firm stroke is given to the bell by the clapper just at the completion of each arc of the bell's oscillation. The impulses being continued by the ringer is technically called raising the bell, because the centre of gravity of the bell at every successive impulse describes a larger arc, and at the termination of every oscillation is raised to a higher point than it had previously attained, until the arc of oscillation becomes a complete circle, and the bell is brought, at the termination of each oscillation, into a position of stable equilibrium, the mouth of the bell being upwards. By allowing the bell to pass a little beyond the vertical line, the ringer is able to hold it in a state of rest. This is called setting the bell. When this has been once accomplished, an expert ringer is able, with very little effort, to pull off his bell again with just so much force as will make it retrace its path and ascend on the other side, until it arrives again in a vertical position, and he can set it at every oscillation, and consequently at every stroke of the clapper. The bell is thus in a state in which he has a considerable control over its movements, for although the ordinary oscillations of the bell are nearly isochronous, he can shorten and accelerate them by checking the rope, lengthen and render them slower by giving the bell more rope, or stop them altogether by setting the bell; and these various alterations in its movements may be made with a moderate amount of exertion on the part of the ringer, because the impulses necessary to produce them are given at the commencement, or near the termination of the bell's oscillations, when the vertical distance through which the centre of gravity of the bell passes is much shorter than the horizontal distance. Change-ringing could not be accomplished without the control which is thus given to the ringers over the movements of their bells. In simply ringing a bell after it has been raised, the only resistance to be overcome is that of the air acting upon the moving bodies of the bell, wheel, and stock, and the friction of the gudgeons, and although these resistances are scarcely felt by the ringer in ringing a well-hung bell for a few strokes, they begin to tell upon him if he continues ringing some time. One object, therefore, to be aimed at in hanging a bell, is to reduce these resistances as much as possible. The stay is a simple adjunct to a bell's gear, consisting of a vertical bar of wood attached to the stock, and projecting somewhat above it. When the bell is set, the extreme end of the stay comes in

contact with a movable stop attached to the framing, which prevents the bell from overturning, and eases the ringer of the trouble of holding his bell when set.

In my patent improvements there are three principal features:—First, a circular boss is cast on the crown of the bell, through which a single bolt of sufficient strength is passed, and attaches the bell to the stock. Secondly, metal is used instead of wood for the stock and other parts. Thirdly, the bell is attached in such a manner to the stock (whether by a single central bolt, or by casting an axis on the top of the crown, or by any similar contrivance), that the bell may be turned round its vertical axis, and present in succession a fresh part of the bell to the blows of the clapper. To facilitate the turning of heavy bells, a screw or pinion and toothed wheel are connected to the boss. The accompanying engravings (p. 360) represent my improvements. Fig. 1 is a side view, fig. 2 is an elevation partly in section, and fig. 3 shows the wheel and pinion arrangement. A is a main central bolt; B, the crown of the bell; C, a boss on the crown, B; D, an iron stock; E E are parts to screw the bell to the stock; F is a square part of the main bolt; G G are the gudgeons; H is a toothed wheel; K, an endless screw; L, a square part of the screw's spindle to receive a spanner; M is a catch for the stay, and N is the stay.*

To cast a central boss is a much more simple operation than to cast cannons on the crown of a bell, as the latter are complicated and expensive to mould, and without care are liable to turn out faulty. The method of attaching the bell to the stock is rendered much more simple by using one main bolt, instead of six to ten links, with their necessary nuts, clamps, and cross-bars; one large bolt is also more secure than a number of small ones, which, in all probability, will not all be screwed up equally tight, and consequently there will be a greater strain on some than on others. The stock of a bell, which is generally more or less cranked, has to stand considerable strains and counter strains, and when made of timber, the bell and wheel are attached to it by iron bolts and fastenings. To insure sufficient strength, it is therefore necessary that a tough and hard wood should be used. Elm possessing these qualities to a greater extent than any other available wood in this country, is that most approved of for the purpose. But elm is one of the worst woods for swelling, shrinking, and warping, when exposed to variation of temperature and moisture; the consequence is that, as the summer advances, all bolts and iron fastenings connected with the moving gear of a peal of bells get loose and require tightening up. The gudgeons also being let into the stock, and bolted to it, are consequently thrown out of truth, and this cannot be permanently rectified in a wooden stock. The Reverend W. C. Lukis,† in his paper on bells read before the Wilts Archæological Society, on the 18th September, 1854, very justly observed, "Bells require very constant attention to keep them in proper ringing order; when you consider their enormous weight, the different parts of their harness, the iron and wood of which it is composed, bolted and screwed together, the frame-work on which they hang, and which in revolving they violently shake and vibrate, and then reflect that the iron and the wood are both exposed to continual changes of atmosphere, when one of those materials expands the other contracts, and that then the bells cannot oscillate so easily, you will form some idea of the care and attention they require to keep them in ringing order." But all the defects which thus attend the use of wooden stocks are completely and effectually remedied in properly constructed iron ones, because the latter have much greater rigidity, and are not liable to warp. The variations caused in them by the extreme temperatures of winter and summer are exceedingly small, and the expansion and contraction is always of a regular nature, so that neither the gudgeons nor any other parts are ever thrown out of truth. Cast-iron stocks have the further advantage of rendering the gudgeons capable of being simply and firmly fixed, and accurately turned; and as their lateral surface is about four-tenths of that presented by wooden ones, they consequently offer a proportionately less resistance to the air when the bells are being rung. A peal of bells would also be rendered fire-proof by the further addition of iron framing.

It is well known by those who are conversant with the subject, that the clappers of bells, by constantly striking the same parts of the sound-bow, wear two indentations, which may be found even three-quarters of an inch deep in bells that have not been cast more than from thirty to fifty years. These indentations must necessarily weaken a bell considerably in the very part that has to sustain the blows of the clapper. It is not uncommon in examining large bells to find that it has been thought prudent or necessary to quarter them, that is, to turn them horizontally one quarter round, in order that their clappers may strike fresh parts of the sound-bows at right angles to those they previously struck. This alteration is attended with much trouble and expense, for the following reasons:—First. The cannons are cast to suit properly only one way of fixing the bell to the stock, so that when

* See also printed Specification of the Patent of Mr. W. L. Baker, 25, Parliament-street, Westminster, (No. 341, 1854).

† *Wilts Archæological and Natural History Magazine*, No. 4, April, 1855.

the bell is turned one quarter round, it is not so convenient to attach the links and fastenings, and the recess in the stock has to be refitted to the cannons. Secondly. The iron links and fastenings require alteration. Thirdly. The iron staple from which the clapper is suspended being cast in the crown of the bell, is consequently moved round with it, and therefore it is found necessary to bolt an extra piece to it so as to form a new joint for the clapper, at right angles to the old one. After all this trouble, quartering is at the best an incomplete remedy, because it presents a fresh part of the sound bow to be also beaten into holes by the clapper. But when a bell is hung upon one central bolt which forms a fixed axis upon which it may be moved round, quartering is no longer necessary, and by turning the screw provided for the purpose, one man can at any time, with great ease, present any part of the sound-bow to the action of the clapper. Thus by proper attention the clapper, instead of producing two deep indentations and ultimately cracking the bell, may be made to wear the whole circumference of the sound-bow equally throughout, and thereby maintain an equality of thickness in the most important sounding part of the bell.

A properly cast bell would, under these circumstances, be exceedingly durable, because the whole circumference of the sound-bow must be deeply worn by the clapper before the bell would be seriously weakened and rendered incapable of sustaining the blows of the clapper without injury.

Bells continue to be public favourites; they are chimed to call us to church, and are rung on joyous occasions; new peals of bells are being constantly cast, and old peals recast with additional bells. The bell is also to be found at the dreary and secluded lighthouse station, where it is rung or tolled in foggy weather when the lights are no longer visible. A bell so placed and used is a powerful agent in the preservation of human life.

While the value of bells is thus universally acknowledged, I hope that my invention, the object of which is to facilitate their use, and increase their durability, will receive a favourable consideration.

Mr. Baker exhibited two beautifully made models of bells, one model showing the old method, and the other his own improvements.

The Chairman, Mr. Hussey, Fellow, invited remarks from any gentleman who might have paid attention to the subject of bells.

Mr. E. B. Denison, Q.C., visitor, said that he had been a bell-ringer for many years, like a very famous member of his profession, Sir Matthew Hale. It seemed to him that the modern bell-founders knew less of their art than the old ones. He had been consulted by the Board of Works, with reference to the bells for the great Westminster clock, which had been made from his designs; and it was proposed to have the bells cast under the superintendence of himself and the Rev. W. Taylor, who had paid great attention to this subject, and from whom he hoped they would hear something to-night; but the Board had now declined any further assistance from them, because they refused to have the Chief Commissioner of Works associated with them, knowing that his interference could not possibly be of any use, and might at any moment become obstructive. He had long been struck with the want of uniformity, both in the hardness and the shape of bells, even in the same peal. He was satisfied that bells, especially large ones, were generally made too thin in the *sound-bow*, and always too thick in the *waist*, for getting the best sound out of a given quantity of metal. Those of which the height was much more than three-quarters of the diameter were always bad. Many of the Italian bells were of a long form, and he understood that they were almost invariably bad.

With regard to Mr. Baker's patent improvements in hanging, he saw no reason why a cast-iron frame should not be successful, if properly made. Bell frames were usually made on the most absurd principle, of what the bellfounders' carpenters call balancing the swings, which they fancied was to be done by making some of the bells swing at right angles to the others. He could not at all approve of Mr. Baker's plan of hanging a large bell by a single bolt, and would be sorry to stand under such a bell to ring it, as the strain was then six times what it was when stationary; even if the bolt itself stood, he thought it not at all unlikely to tear the crown out. The object of presenting a new part of the bell to the clapper might be obtained much better by casting the bell with a broad and low neck with a flanch all round it, instead of cannons, to which as many bolts as thought fit might be attached, going through the stock, and the clapper might be hung from a bolt through the crown and stock, fitting with a square into the latter, like Mr. Baker's plan in that respect. He agreed with Mr. Baker that the *sliders* very commonly occasion unnecessary friction in ringing. But he had himself altered the sliders of a peal of bells which he used to ring above twenty years ago, by making them run in circular grooves struck from the gudgeons of the bell, and this produced the same effect as Mr. Baker's more complicated plan; and if a slider was broken, it only used to cost sixpence to put in a new one, as they need only be sticks, and not pieces of carpentry, when made to run lightly.

Mr. Baker defended his proposed method of hanging bells by observing that the central bolt might be made strong enough to resist any strain thrown on it. After a long spell of ringing, a ringer would be convinced of the advantage of his proposed method.

Mr. Ashpitel, Fellow, had paid much attention to bells on the Continent. At Rome he had observed that the clapper was so hung as to have some play round the sound-bow, and not to strike always on the same point. Mr. Ashpitel's practice in hanging bells was, to fix strong stone corbels in the walls of the tower; on these corbels he placed the main girders quite free of the wall, with a space of 1 inch or more allowance for play, on them the floor, and on the floor the bell frame or cage, but not fixed to it, so that each of these parts might move independently of the others.

Mr. C. H. Smith, visitor, believed that all bells must, from their crystalline nature, sooner or later become cracked, even though they might last 500 years before the failure took place. He would submit as an interesting problem—find the best shape to produce, from a given quantity of material, the best sound without liability to fracture. He would advocate striking the bell quietly in preference to swinging it to produce tone.

The Rev. Wm. Taylor, visitor, could not agree as to striking bells quietly, for they always sound better when swinging than when struck without moving. In the composition of the metal, great care was required that it should not be overheated, as, in that case, the tin would be driven off. He had seen many of the large bells on the continent. That at Erfurth weighed 15 tons, and required twenty-eight men to ring it; who, by means of two wheels and cables, were enabled fairly to *set it*. The bell at York Minster weighed only 10 tons;* but thirty-four men had in vain tried to *set it*. At Erfurth the stock was quite straight on the underside. At York, as in England generally in large bells, the crown of the bell was let into the stock; this might have some influence in causing the difficulty of raising it.

Mr. Denison showed that the effect of sinking a bell into the stock not only weakened the stock, but made the clapper *rise false;* that is, on the down-side instead of the up-side of the bell. He had no doubt, with Mr. Taylor, that this was the reason of the impossibility of raising the York bell, and believed that mode of hanging to be wrong.

On the motion of Mr. Donaldson, H.S.F.C., thanks were voted to Mr. Baker for his paper, and to the gentlemen who had favoured the meeting with their views on this subject.

(*To be continued.*)

MERCHANT SHIPPING REGISTRATION ACT.

MR. ATHERTON'S PAPER ON TONNAGE REGISTRATION READ BEFORE THE SOCIETY OF ARTS, ON THE 16TH JANUARY, 1856.

(*Concluded from p. 343.*)

One thing we may willingly and at once concede, viz., that "the internal mode of admeasurement of tonnage *does not* pre-eminently, above all other systems of measurement, afford elementary data of any use towards determining the relative *locomotive* merits of ships." What then? It has never been sought by legislation to afford such data. The genius of the government in this country has always been, not to interfere more than necessary with private enterprise; its functions have been limited to removing impediments in the way of the vigorous and healthful development of the resources of the country. We think that progress in mercantile naval architecture, and in the production of ships of improved locomotive merits, may well be left to that spirit of energy and competition which has hitherto been the source of all the improvements in these sciences. Mr. Atherton may depend upon it, that when a clipper is turned off the stocks of any of our shipbuilding firms, the most important data on which its properties are based, are no secret to the rest of the craft. It requires no Act of Parliament to put those interested in the knowledge in possession of all the information they require; while it is certain that a compulsory publication of such facts would be resented as un-English, tyrannical, and inquisitorial in the highest degree.

The British Government has never been a very successful patron or cultivator of science; and no branch of science has been less beholden to it for its development and progress than naval architecture. The present type of build prevalent among ships of

* Mr. Baker, under date March 17, 1855, forwarded the following communication :—"The great bell at York is furnished with two wheels, and two ropes to each wheel; it weighs 10 tons 15 cwt., and is considerably the largest bell in this country, being 7 cwt. more than twice the weight of the great bell of St. Paul's in London."

Messrs. Mears, of Whitechapel, also wrote that "the great bell at York Minster was completely raised and fairly rung by *sixteen men*, on the 21st of August, 1845. There were four ropes, and four men to each rope."

war has been forced upon the Admiralty authorities, in spite of deep-rooted prejudices in favour of Chapman's forms and bluff bows, by the stern realities presented by the mercantile navy. And we all know that for many years, commencing about the year 1833, the reign of ignorance and pseudo-science in the Royal Ship-building Department entailed unheard-of expense on the country, and inflicted injuries on the Royal Marine from which it has barely yet recovered. The less government interferes by *positive enactments* with reference to the forms, &c., of our ships, the better. Its business is to make fair enactments for levying the necessary dues, and to see that the shipowner and shipbuilder have fair play. We have no wish to see it step one inch beyond that well-defined limit to its sphere.

We now come to the consideration of the special objections Mr. Atherton raises to the present method of measurement, and the system he proposes to substitute for it. He rightly informs us that "the well-known system of approximate admeasurement by ordinates," called "Stirling's rule," is the basis of the present rule. He is here particularly eloquent on the "repulsive and impracticable character of long dogmatic rules for the working out of calculations of which the rationale is not understood by the generality of those concerned or employed to do the work." He afterwards stigmatises it as the "solution of the mathematical problem for the *reduction of parallelopipedons by rectangular co-ordinates*," and he says, that, if called by this name, it would not be listened to for one moment. What, then, does he propose to substitute for this method, which he cannot deny does accurately measure what is sought to be known? He divides the ship into three parts; first, up to the light draught; second, between the light and deep draughts (the latter a legally fixed point); and third, between the latter point and the main deck. The length and breadth of the ship are taken at each of these points, and the corresponding depths. He multiplies these three dimensions together for each of these portions, and multiplies the result for each portion by a factor depending upon the greater or less degree of fulness of the lines of the vessels. A similar plan he proposes for the *internal roomage*. In this way Mr. Atherton solves the problem for the *reduction of parallelopipedons;* not mathematically, we readily admit, nor by the method of rectangular co-ordinates.

Now the first thing that strikes us here is, that he wants to substitute an *inaccurate* for an *accurate* measurement; and we may remark that were it needful to take external measurement, the present authorised rule would be equally efficient for determining it as it is now for ascertaining the internal measurement. Mr. Atherton's factor is purely empirical, and only intended to give a result correct within a certain per centage. This is not very satisfactory. And then who is to judge of the relative degree of fulness of the vessel and of the proper factor to be employed? Who cannot see the evils which this uncertainty must produce—the dissatisfaction on the part of the owner, and the suspicion, to say the least, which may sometimes attach to the officer charged with this duty of being influenced by corrupt motives in his decision?

Besides, who can deny that such a system of empirical factors must either be altered from time to time to meet probable changes in the forms of ships, or it must produce that very evil which has been formerly so much felt, and which it has been one great object of the Government to remedy, viz., giving a premium to one or two particular types of build. And, after all, any one experienced in these matters would *guess* the ship's displacement quite as accurately as Mr. Atherton's rule would give it.

Mr. Atherton makes it a *merit* of his proposition that "it does not embrace the objectionable and inquisitorial system of taking off the builder's lines of a ship, as is done in the admeasurements under the Merchant Shipping Law of 1854." On the other hand, the *one* merit of Mr. Atherton's propositions is, that they are intended to meet a *scientific* want. A comparison of the "relative *locomotive* merits of ships" is the one thing for which an *accurate* knowledge of the deep displacement is needful, and which the measurement of the internal roomage will not suffice to give. Every scientific man knows that, with the *most accurate data* in any given case attainable, the margin for the creeping in of error is quite wide enough; consequently, those who are most versed in the conduct of scientific inquiries, think no pains and labour ill bestowed that will render their data as accurate as they can be made. But Mr. Atherton makes it a *merit* in his proposed scientific data that they are to be *inaccurate!* Valuable, indeed, would be the scientific knowledge obtained by such notable means!

Mr. Atherton slightly notices a "system of measurement by means of a curve of vertical sections, which system is understood to have been originally suggested and practically applied in the year 1829, by Mr. James Peake, a shipwright officer in Her Majesty's service, and is *certainly a system readily applied*, and *capable of giving even more correct results* than are obtained by Stirling's rule." We have yet to learn that

Mr. Peake's mode of calculation possesses either of these last-named qualities in a higher degree than Stirling's rule. And the curve of sections—which is, whether rightly or wrongly, ascribed to Mr. Peake—is no more than the representation by means of a curve of the well-known method of interpolation. We have had the curiosity to refer to Mr. Peake's little work, professing to give the science of naval architecture, but which is, in reality, limited to calculations, published in Weale's series; and the chief difference between his and the usual method is, that he divides his areas into triangles. Now we have no hesitation in saying that, to apply intelligently and with precision the rules for the solution of triangles, implies the possession of a higher amount of mathematical acquirements than to apply Stirling's method "for the reduction of parallelopipedons by rectangular co-ordinates."

It is a very easy thing to give a ridiculous name to anything, however useful, and so to bring it into disrepute; but we will go bail that no one ever ventured before to give to Stirling's rule the appellation of "the solution of the mathematical problem for the *reduction of parallelopipedons by rectangular co-ordinates.*" And, what is more, we venture to affirm that no one would have understood what was meant by this designation had it been used. Mr. Atherton may have a clear idea of what is meant by the reduction of parallelopipedons—we confess not to be able to penetrate the mystery.

Now, what is it that is required? Surely to obtain the closest available approximation to the cubical contents of the vessel. And if by measuring breadths at certain definite intervals, we can readily attain this object, it seems to us that nothing more simple could be desired.

We remember in the course of our life to have fallen in with physicians who have overlaid the descriptions of the most ordinary maladies by such awful terms of art as to completely mystify the unhappy patient. In the same style Mr. Atherton describes a most intelligible rule as "the solution" (*which it is not*) "of the mathematical problem for the reduction of parallelopipedons by rectangular co-ordinates."

The uninitiated among our readers will doubtless be very much surprised to learn that this is nothing but an euphonious or cacophonous (which you please) synonyme for this—a rule for approximating to the cubical contents of a vessel by breadths measured at regular intervals. Now, as regards the intelligent application of this rule, we may observe that hundreds of workmen, acquainted only with arithmetic, apply intelligently and correctly the rules for extraction of square and cube roots of numbers, the rationale of which it is impossible for them to comprehend without some knowledge of algebra.

And further, to any one who can be made to understand that the area of a parallelogram is the product of one of its sides, and the perpendicular let fall upon it from one of the opposite angles, and that the area of a triangle is one-half such product, we would undertake to make the rationale of the rule authorised by the Merchant Shipping Act clear with very little trouble. The rule itself is so simple, and so readily applied, that we are informed that the tonnage of no less than 1100 vessels was recalculated during last year on this law, by the ordinary officers, with the greatest ease and satisfaction to all parties concerned! We are really tempted to give a brief outline of this—in Mr. Atherton's judgment—complicated method of proceeding:

Suppose the whole vessel divided into an even number of portions by an odd number of sections at regular equal distances. And again, suppose each of the sections divided into an equal number of portions by an odd number of *breadths*, also at regular equal intervals (not necessarily the same for each section). To obtain the area of one of the sections, we have only to add together the first and last breadths, four times the sum of the even breadths, and twice the sum of odd breadths, exclusive of the first and last, and multiply the number so obtained by one-third of the common interval. To obtain the cubical contents, consider each of the areas so obtained as the breadth to a new curve, and proceed exactly as before.

Suppose the first section A_1 to have seven breadths, $a_1, a_2, a_3, \ldots a_7$, and m to be the common interval between them: then

$$A_1 = \left\{ a_1 + a_7 + 4(a_2 + a_4 + a_6) + 2(a_3 + a_5) \right\} \frac{m}{3},$$

and so on for $A_2, A_3, \ldots A_7$, the other sections, supposing there are seven: and if S be the cubical contents required, and n the interval between each pair,

$$S = \left\{ A_1 + A_7 + 4(A_2 + A_4 + A_6) + 2(A_3 + A_5) \right\} \frac{n}{3}.$$

We cannot really understand this rule being considered as complicated. We are

almost ashamed to enlarge upon these well-known topics; but we think justice to the impugned rules requires this notice.*

Upon the whole, then, we consider that Mr. Atherton's case against the New Law of Tonnage has signally failed. He looks to it to perform an office which it was never intended to perform, and which it could not conveniently be made to perform, viz., to act as a guarantee for the safety of vessels against shipwreck. He seeks to substitute for an easily applied correct approximation, a very clumsy empirical formula, which is but a small improvement on the old builder's measurement. He founds his whole system on the old rock on which so many former attempts to measure tonnage have split, viz., the accurate determination of the load water-line; and after all this accuracy in one element, he makes his final result valueless by excessive inaccuracy in other elements; to use his own metaphor, he strains at a gnat in endeavouring to fix the deep draught, on which builders cannot be made to agree, and swallows a camel in multiplying his results by an empirical factor, leaving the particular factor to be employed so uncertain as to depend upon some officer or another's judgment of the greater or less degree of the fineness of the lines of the ship; and, to conclude all, feeling, no doubt, the weakness of his case, he calls the authorized rule hard names to raise an unfair prejudice against it.

For scientific purposes, doubtless a knowledge of the real displacement of vessels, and of the horse power employed at certain rates of steaming, would be very valuable. To obtain this knowledge, however, by Act of Parliament, we believe, at present at all events, impracticable—more injurious than beneficial to the interests of naval architecture—sanctioning a principle of direct interference on the part of Government in private enterprise, which must tend to injure the free character of that enterprise, on which it depends for its healthy and vigorous existence—and introducing into this country vexatious and inquisitorial proceedings which are most unsuited to its genius, and which we most heartily pray may never be sanctioned.

Nor do we think that the Government are fairly chargeable with the blame of having left the security of life unprovided for in the Merchant Shipping Act of 1854. Persons having a direct personal interest in shipping have, on the contrary, loudly complained of the great hardships and severe mulcts to which many of its provisions subject them in cases of loss and injury in which no blame is imputable to the owner. For our part, we think a perusal of those parts of the Act which bear on shipwrecks and loss of life will show that Government has involved the owner in such responsibilities in case of accidents, that it is his most direct interest to provide most anxiously and carefully against their occurrence. Mr. Atherton has made himself merry with several of the penalties which he considers quite inadequate. And he comments in terms of no small severity on the ninth part of the Act, which contains clauses for the *limitation* of the shipowner's liability—a thing, he says, before unheard of.

Now, on referring to these clauses, we find that such limitation of liability refers *solely to those cases in which the loss or damage to be made good shall happen without the actual fault or privity of the owner.* But in cases where the loss or damage can be fairly laid to the door of the owner, then is there no such limitation of liability, but the assessment of the damages is left to a jury.

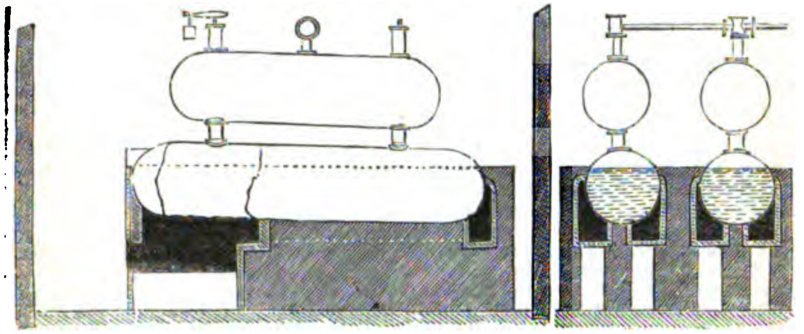
If, however, these provisions are still insufficient (the shipping interests exclaim against their hardship and injustice), then add to them whatever may serve to insure a due amount of caution and care on the part of the owner. Let us not, however, be so illogical as to charge to the very innocent clauses for tonnage registration—enacted with the sole view of levying tolls fairly—the tremendous consequences of culpable negligence with respect to human life which would be chargeable (if at all) on quite a different set of provisions in the Act.

Lastly, one word as to the value of the scientific objects Mr. Atherton wishes to secure. No one can appreciate these more highly than we do. We believe that much good would result from the free interchange amongst shipbuilders of the data upon which they must be founded. But then this interchange, to do any good, must be voluntary, not enforced; and we must trust to the diffusion of scientific knowledge amongst this class, and to a love—let us hope a growing love—for science itself among them, for the attainment of this most desirable end. One of the worst ways to secure the good will of the shipping interests to science, and to enlist their sympathies on her side, is to make an onslaught, tooth and nail, with or without reason, on what they hold, and justly hold, in respect, and involve them all in one general charge of doggedly pursuing their own ill-gotten gains against the general good of society at large. As real and sincere lovers of science, and, we believe, in her best interests, we beg most emphatically to separate her cause from the too-zealous advocacy of Mr. Atherton.

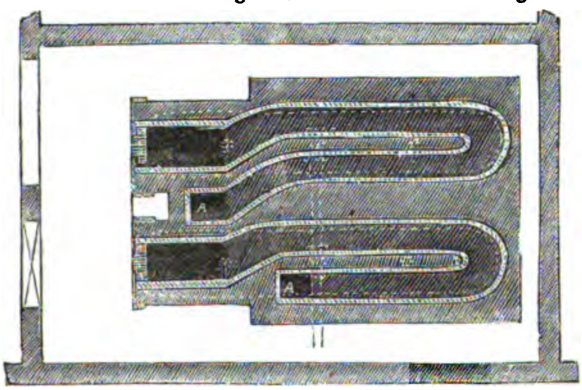
* In our next Number we propose to publish a note explanatory of the mode of tonnage admeasurement, in order that the whole subject may be placed fully before our readers.

BOILER EXPLOSION AT PORTSMOUTH DOCKYARD.

A serious and fatal explosion of a boiler took place in the dockyard at Portsmouth on the 5th instant. The boiler, as shown in the accompanying engravings, was cylindrical, with hemispherical ends. It was 24 feet long, 4 feet 6 inches diameter, and composed of Low Moor or other Yorkshire plates $\frac{7}{16}$ths of an inch thick, without any flues or tubes through it, and had been in use for about two years. At the time of the explosion a second similar boiler was in operation with it for the supply of the steam hammers. Large steam receivers were fitted to the boilers, so as to render the supply of steam as equable as possible. Each boiler was fitted with one safety valve $4\frac{5}{8}$ inches diameter, and one of 4 inches diameter—making four safety valves in operation; they



were loaded to 60 lbs. pressure on the square inch. The boilers were supplied with water by two steam pumps, working separately, each supplying its own boiler. They were fitted with the common glass water gauge, water-gauge cocks, and a float-gauge, and with common mercurial steam gauges, and two patent steam gauges. The fire was under the boiler, and the flue passed round it, and then dipped into an underground flue, A. The appearance of the plates of the boiler, and the manner in which it gave way, prove that the boiler must have been allowed to get short of water, and become red hot, though the fireman in attendance stated that he opened his water-gauge cocks about an hour before the accident, and that he saw water in the glass a few minutes before it. He must, however, have been deceived. The blow-off cock and pipe were quite sound, and there seemed to be no reasons for supposing that the water had escaped by that means. A longitudinal rent of about 5 feet long took place in the



middle of the plate directly over the fire, and this part of the boiler opened up and spread out, tearing up the plates round the circle of the boiler, both before and behind it, and thus separating itself from the front and hinder parts. All the parts were thrown to a considerable distance; but there seems to be no reason for supposing, in this case, that there was any sudden generation of any undue quantity of steam so as to increase the pressure, nor of any explosive gases. One of the steam hammers was at work at the time of the accident, and there had been no cessation of work.

FAIRBAIRN'S PUMPING ENGINE.

To the Editor of the Mechanics' Magazine.

Sir,—I observe in your last publication a drawing and description of an improved pumping engine, made by Mr. Fairbairn, of Manchester, in 1851, with side levers working on each side of the cylinder, all fixed low on a platform, about the level of the ground, instead of the beam overhead, and consequent heavy lever wall, and engine house. The arrangement is not novel; we have three in this county, and two in Fifeshire, the only difference being, that the cross-head is guided in slides, instead of a parallel motion. The first was drawn out from my specifications, and its making superintended by Mr. Sims, of Redruth, at the works of Sandys, Cairne and Vivian, Cornwall, in 1843; it had an 80-inch cylinder, and 11 feet stroke. Other three with 60-inch cylinders and 9 feet stroke, were designed by me, and made at the Leith Engine Works; one in 1844, another in 1846, and the third in 1847. The fifth was made by Messrs. Hawthorn and Co., of Leith, for the Duke of Buccleuch, I think in 1849. They are all at work, except one, which is being shifted to another shaft. The saving of building was considerable, and the stability of the machine very superior to the old beam engine. But I have abandoned this form since 1851, for a much cheaper one, viz., the direct-action form, with a very long stroke, which effects a saving of one-half in first cost of engine and buildings.

I am, Sir, yours, &c.,
D. Landale.
Mining Engineer.

6, Forth-street, Edinburgh,
April 15, 1856.

GARDNER'S PATENT SMOKE-CONSUMER.

To the Editor of the Mechanics' Magazine.

Sir,—Letters have appeared in your journal respecting the above, and probably some of your readers may have thought that "The Inventor of Gardner's Patent Smoke-consumer" ought to have been Mr. Gardner himself, and will be surprised to learn that he was not, that his invention is no invention, and his patent invalid, as the following remarks will show. Unwilling as I am to intrude upon your valuable space, I must, in justice to myself, solicit attention to my own plans (often before alluded to in your journal) for the "Prevention of Smoke," and to my patent for "The Improved Combustion of Fuel," dated some seven months earlier than Mr. Gardner's, in order to show that both those plans, and that patent, comprised and anticipated all that is valuable in Mr. Gardner's arrangements. I take the following from my specification:—

"A hanging bridge is placed a little forward of the hinder or ordinary bridge, so arranged as to cause the products of combustion which rise up from the fire in front of the bridge, to be directed downwards below the hanging bridge," and that "the products of combustion rising up in the space between the two bridges will be supplied with numerous streams of air." And in my paper on this subject read before the "Institute of Civil Engineers," some five months before the date of Mr. Gardner's patent, amongst other advantages for which that gentleman now claims credit, I stated, as a chief value of my invention, that "The peculiar position of the inverted bridge compels the flame and gases to impinge upon the incandescent coke or carbon lying upon the extremity of the fire-bars, whilst the gases, as they leave the fuel in distillation, are entirely surrounded by small jets of atmospheric air." We may now investigate Mr. Gardner's claim. I copy from his own provisional and complete specifications. He says, "The said invention consists in certain arrangements of diaphragms" (simply bridges) "in the furnace, so disposed as to cause the products given off from fuel to pass through or in contact with the heated material on the fire-grate, and to cause the so heated material and products to be brought into contact with sufficient supplies of air to produce combination therewith, and render their combustion perfect." And he concludes his complete specification by saying, "I do not limit myself to the precise detail herein specified, preserving to myself the exclusive right of using any other methods substantially the same to all intents and purposes as those I have herein specified."

Thus Mr. Gardner would claim the exclusive right of using my patent; for it is evident that both patents are "substantially the same to all intents and purposes." Mr. Gardner has made a few colourable alterations in the details, every one of which is productive of mischief, either to the boiler, to the durability of the apparatus, or in causing an increase of labour and annoyance to the stoker; and no one of these alterations is the slightest improvement. I could easily explain myself more fully, but Mr. Gardner is, on these matters, evidently working in the dark, and it is no part of my object, under present circumstances, to enlighten him.

In such a case as this, ought not they to sympathize who wish to avoid Chancery, and yet are driven into it as the only way by which to secure their rights? And is it not an anomalous and reprehensible condition

of the law, that an offence of this kind should be difficult of chastisement in direct proportion to the obscurity and unscrupulousness of the offender. I am, Sir, &c.,

WM. WOODCOCK.

12, Bishopsgate-street Within,
April 15, 1856.

PROSPECTS OF STEAM CULTURE.

To the Editor of the Mechanics' Magazine.

SIR,—I shall ever be most willing to furnish all the information in my power to any reasonable inquirer. I cannot, however, regard the desire of "Agricola," in your last number (page 348), to be "wise above that which is written," as either a modest or reasonable request.

In my announcement (not *puff*) of Mr. Hart's recently patented improvements in steam engines as applied to agriculture, I stated the *probability* that these improvements might be sufficiently matured for public exhibition at the meeting of the Royal Agricultural Society in July next; nothing in my communication could justify the assumption of "Agricola," that Mr. Hart's invention was complete, or "waiting for trial!"

I apprehend that few persons know better than "Agricola" how many deficiencies are detected, and how many alterations and improvements are suggested during the practical development of even a comparatively simple piece of mechanism.

The fact is, that the prize-givings of the Royal Agricultural Society have unhappily led to such a system of *espionage* and *inquisitiveness* into the proceedings of rival manufacturers, and have induced a competition so excessive and unfairly carried out, as to evidence a lamentably low standard of manufacturing morality.

I am, Sir, yours, &c.,

WM. BADDELEY.

18, Angell-terrace, Islington,
April 14, 1856.

MECHANICAL LOCOMOTION.

To the Editor of the Mechanics' Magazine.

SIR,—When I said that I could not understand "C." in his explanation of the action of a locomotive engine, I spoke truly; and "C."'s long letter in your last number only convinces me that my time would have been thrown away in making any lengthened attempt to do so. In my remarks, in accordance with your admonition, I will endeavour to be as brief as possible. It is a fundamental law in mechanical science, based on experience and reason, that when a motive power is contained within the body itself which is to be moved, no useful work can result unless there is an external obstacle on which the force can be made to act. However great, for instance, the muscular exertion by which an arm is thrust forward from the body, no effect whatever is produced unless there be some object against which it impinges. The whole of the effect produced without such external obstacle is simply of the nature of action and an equal reaction.

The same is true of a steam engine. Take the case of a standard engine. No portion of the pressure on the piston, or on the end of the cylinder, has the smallest tendency to move the engine, or to produce a pressure (of any considerable extent) on the supports in a lateral direction, which ought to be the case on "C."'s hypothesis. There is indeed motion, but it is of the piston, which, not being fixed, is necessarily moved by the pressure of the steam upon it: the pressure on the face of the cylinder has simply the effect of producing *a tendency to separate the cylinder-cover from the rest of the machine*, which is counterbalanced by the strength of the materials of which it is composed. The fallacy into which "C." has fallen is the "supposition" or "hypothesis" (I cannot distinguish between the two terms) that a pressure of 1000 lbs. can possibly be exerted in a cylinder without having a *corresponding* (I do not say equal) resistance to overcome.

Common every-day experience of locomotive engines abundantly proves this. Why is it that the same engine applied to two trains, one light and the other heavy, drives the former with far greater velocity than the latter? Simply because the *resistance* to motion—that is, the friction of the rail—is far less in the former case than in the latter, and consequently the steam pressure is far less. If, therefore, the same amount of steam is supplied in both cases, the quantity of steam admitted in each stroke is far less with the lighter load than with the heavier, and the number of strokes, and, by consequence, the speed of the lighter train, is greater in the same ratio. Suppose in a standard engine the connection between the shaft and the resistances to be overcome be removed, what is the consequence? Simply that the motion of the piston would become extremely rapid, the pressure on it being reduced to such a point that it is only just sufficient to overcome the friction of the parts of the machine in motion.

According to "C."'s "hypothesis," engines with vertical cylinders on board ship ought to have the effect of alternately raising and depressing the ship according as the steam presses on the upper or lower end of the cylinder. Horizontal engines in the same manner ought to produce the effect of propelling the vessel of themselves, without

the intervention of a screw or other instrument of propulsion. Common sense and every day's experience teach us that such an effect is never produced. And why? Because the pressure on the end of the cylinder can have only the effect I have described above—of tending to separate it from the rest of the engine.

Moreover, when a train or any other body is moving uniformly, there can be no unbalanced pressure to move forward the body such as "C." supposes; for then the motion would be accelerated indefinitely. It is a fundamental law, which admits of no contradiction, that when a body is moving uniformly in any direction, the resultant of the forces tending to move it in one direction must be exactly equal and opposite to the resultant of the forces tending to move it in the other direction.

How, then, do we account for the motion of a train propelled by a locomotive engine? Putting out of the question the short period during which the motion is accelerated, and considering only the case when the motion has become uniform, the pressure on the piston is such as is just sufficient to balance the resistance of the rail. This friction or resistance is, however, such as to allow of no *sliding;* hence it follows necessarily that the driving-wheel, in turning round, must carry the train along with it.

It is very easy to reduce this principle to calculation; and, in fact, all calculations which are made for the proportioning of the horse power of an engine to the work it has to do in propelling a train at a given velocity, are made entirely in this manner. Thus if P be the mean effective pressure on the piston, and V its velocity; F the resistance of the rails, and v the velocity at the outside of the wheel in contact with the rail, and therefore, as we have seen, the velocity of the train,—we have invariably this relation (neglecting the resistance of the air): $PV = Fv$. So long as the horse power exerted by the engine is the same, PV is invariable; however, under varying circumstances, P and V may be made to vary severally. If therefore F vary, v, or the speed of the train, will vary in the inverse ratio to it.

In railway locomotion, the friction or resistance of the rail is proved by experiment to be about 8 lbs. per ton weight. Suppose the same engine exerting, that is, the same horse power to be successively applied to drive a train of 80 and of 100 tons weight; and suppose in the latter case the speed is 24 miles an hour, in the former case it will be, on this "hypothesis," $= \frac{100}{80} \times 24$ miles $= 30$ miles an hour.

Allowing for the effect of the resistance of the air, this is abundantly proved by experience: and thus "C." 's "hypothesis" is condemned, and the "hypothesis" I have advanced is established.

I have very few remarks to offer on other points in "C." 's last letter. The great fallacy I have endeavoured to point out is the foundation of all that he has written. I cannot, however, pass over one or two stray remarks. Thus, he tells us, "It used to be said that the friction was the same at different speeds;" as if the contrary to this were now the received "hypothesis." I can tell "C." that "clever men of science," indeed, all men of real science, not only "held," but still do hold this view, which has been proved by the most elaborate and accurate experiments of men whose names are deservedly held in the highest honour by the scientific world; nor will they be inclined to hold a different view until "C." or some other experimenter has shown good cause for the change.

What "C." means by calling friction a "forceless thing," that is, by calling a force which presents a resistance to motion not only capable of exact measurement, but which has been exactly measured, not a force—is perhaps analogous to the distinction he sets up between a "supposition" and a "hypothesis," very subtle and ingenious, no doubt, but very unintelligible too.

The "difference of doctors" on this question, is possibly more apparent than real, and may arise not from a real diversity of views, but from "C.'s" failing to comprehend what they mean, and from an effort on their part (not always successful) to explain scientific truths by the aid of popular ideas.

This at least I can say, that in no sound work on mechanical philosophy is any different "hypothesis" propounded than that which I have endeavoured, so far as the limits of a letter of this kind will permit, to lay before your readers.

"C." has entirely misunderstood what I said about the word *fulcrum.* I said that a was *originally* applied to the case only of it fixed obstacle, or support, and I deprecated the use of it, as I still most emphatically do deprecate it, as tending to create rather confusion than precision of views in dealing with such questions as are now under discussion. I shall not deal with "C." 's explanation of the motion of a row-boat further than to make one remark on his statement that my disquisition is "unnecessarily complicated and quite insufficient."

Now, be it observed, the whole of this discussion arose from two "disquisitions," one by Mr. Cheverton and the other by

"C.," on the position of the fulcrum in a locomotive engine—the position of the said fulcrum being supposed to affect most materially the theory of the engine. I concerned myself to show that in the usual sense of the word *fulcrum*—where motion is uniform—it is a matter of perfect indifference what point in the moving body be taken for it; and this I showed in what I conceive to be a most satisfactory way, viz., by forming the equations of moments about several such points, in a particular case, and showing that they are all equally correct. There is no unnecessary complication in this mode of treating the subject—for I cannot see how I could otherwise make good my position.

Until "C.," therefore, can *disprove* what I have advanced—until he can show that any of my equations are incorrect or incompatible with each other—I trust that your readers will estimate at its proper value, his attempt to evade the force of my argument by an expedient, which, I will allow, has the merit of simplicity at all events, viz., putting it on one side as "appearing to him unnecessarily complicated and quite insufficient"—though on what grounds he does not condescend to inform us.

For reasons analogous to those I have advanced in the case of the locomotive engine, and which your intelligent readers will readily supply for themselves, I, with reason on my side, have no hesitation in pronouncing "C."'s explanation "quite insufficient."

In conclusion, I am glad to agree with "C." (which, unfortunately, I seldom find myself able to do) in his belief that, in solving the problem proposed, we have no need of any complicated theory, but have only to take the general laws of motion and apply them simply to the forces which are impressed on the machine. It is because, in his attempts at a solution, he adopts other laws than "those common laws of science which all admit," that I cannot agree with him; and I really believe that the impossibility he finds in "reconciling the common theory" (if, by common theory, he means that adopted generally by men of science) with facts, must arise from his not attaching the same ideas to the "common theory," as our recognized authorities do. At all events, I cannot allow the explanation he gives the merit he claims for it, of either "simplicity" or "sufficiency," nor even of its not venturing beyond the "boundaries of the well-proved laws of science."

I am, Sir, yours, &c., W.

London, April 7, 1856.

P. S.—Since writing the above, Mr. Cheverton's long letter in reply to me has come under my notice. My answer will be as brief as I can make it. Mr. Cheverton endeavours to set up a wonderful distinction between mathematical or theoretical and practical mechanics. Considering that mathematicians take the data supplied by practical men for the basis of operations, and apply to these the resources of their art, I cannot imagine how mathematical mechanics and practical mechanics, so far as theory goes, can have this antagonism which Mr. Cheverton and others are so anxious to detect. The antagonism I think which really does exist, and which he in his heart of hearts means, is between persons who by reason of their acquirements are capable of dealing with mechanical problems, and the class who delight in the appellation of *practical* men, whose acquirements in scientific knowledge are *nil*, but who think that because they are employed in making engines, or in working engines, they must know all about them. With these gentlemen it is a crime to possess any knowledge of the resources of mathematical science; and thus it appears, that by my showing some little knowledge of this kind, I am at once placed by Mr. Cheverton in the category of *mere theorists*. It is undoubtedly a great advantage to "practical men" of this class, to establish such a distinction. But what, in the name of reason, can be the foundations of it? I know that in this country there is a great tendency to make the possession of some accidental distinction, or some knowledge of a purely practical kind, such as any skilled mechanic necessarily picks up in the exercise of his calling, take the place of real science, and give the fortunate practical man claims to attention in preference to the man who really does know something about it.

For example, we all know that a post-captain, whatever be his previous ignorance, comes into possession of the most recondite knowledge and capacity in every matter immediately on his promotion. The captain of the Excellent gunnery ship, by virtue of his appointment, becomes the greatest authority on gunnery in the country. Another man is justified in ridiculing the teachings of a learned professor, who has received his education in a university, because, forsooth, he has worked in a coal-pit, and, therefore, as a workman, must know all about it. Another man, *because* he is a practical engineer, and is called on in the exercise of his profession to build engines, or walls, or docks, must sneer at the mechanical knowledge of the mathematician who has not been so fortunately circumstanced.

And in what sort of questions is it that they set up as pre-eminent authorities? Is it in judging "practically" of the state of repair of a pair of engines, of a boiler, of a wall, or a road? Is it in estimating the number of bricks, or number of tons of iron, such and such a work will consume, and its probable cost? Nothing of the sort! It is in *purely theoretical* questions that they claim pre-eminence on account of their practical attainments. Woe betide the advancement of mechanical science if it is allowed to fall into the hands of these practical men! Mr. Cheverton, perhaps, does not know that from simple ignorance of an elementary mechanical principle, which I have enumerated in my letter, the theory of the steam-engine, which was unfortunately long left to practical men, was for many years absurdly wide of the mark. It was reserved for a French savant, the Comte de Pambour, a profound mathematician, to place it on a sound and creditable basis.

I have said it is a great advantage to "practical men" to try to establish a distinction (which *cannot* exist) between theoretical and practical mechanics; and for this reason, among others, that they are thereby entitled to use scientific terms in the most loose and vague manner, and thus to be able to give such explanation of their "conceptions" as they please. In fact the language of science in their mouths means—just what you like.

Nothing can illustrate this more forcibly than Mr. Cheverton's letter, where he makes a most absurd distinction between *abstract* and *concrete* conceptions of force, which shows little but his ignorance of the mode in which mechanical problems are treated. For my part, when treating of forces, my ideas are *concrete* enough. I usually attach to the word force the idea of a pressure equivalent to so many pound weights, acting in a definite direction at a definite point. What more "concrete" idea could the most practical man entertain? I certainly am not in the habit of looking at any two forces which are concerned in a locomotive under what Mr. Cheverton fasely calls their practical aspect and designation—"Power and Work." And that because if I were to do so I should commit an egregious "practical" as well as "theoretical" blunder. A simple relation between two forces at any moment of their action, such as Mr. Cheverton contemplates, does not involve the idea of "work" at all. From this and another combination of terms, in which he says that "it sounds like a solecism to speak of three *forces* in equilibrium in connection with *power, fulcrum*, and *work*," I can only conclude that Mr. Cheverton's notions are of the most meagre and unsatisfactory kind. They are exactly of the nature which, by dire experience, I have discovered, is sure to characterise the notions of those who vaunt themselves in the appellation of "practical men." I have had the misfortune to enter into controversy with several of this class through the medium of your pages. And now, directly I find a gentleman endeavouring to evade the cogency of argument by a refuge to his "practical capacity," I know at once what to expect.

A "practical man" of this class has usually imbibed what few ideas he has on mechanics from the perusal of some popular work; he is never able to get above the most simple considerations of levers, and hence his real attachment to the word *fulcrum*; because, in all such elementary lessons, a lever is supposed to be furnished with "a fixed point in its length, about which it is capable of turning freely, which is called its fulcrum."

It is not worth while pursuing Mr. Cheverton's remark on this head much further, simply because he attributes to what he is pleased to call "truth of a mathematical kind, partial and abstract," absurdities which would really entitle a mathematician who entertains such views to take his rank among "practical men."

Far be it from me in these remarks to be thought to reflect upon *really* practical men, such as Professor Rankine and others, who combine a genuine knowledge of principles and practice, and who know how to appreciate (none better) the true correspondence between sound theory and sound practice.

Unfortunately for himself, Mr. Cheverton has attempted to deal with the equations of moments, with which I furnished him, and has made a signal display of his inability to cope with questions of this kind. He does not, I presume, deny that when forces, or if he likes better, power, and (I cannot imitate his error in saying work, but say) resistance, are in equilibrium on a lever, they are inversely as their distances from the fulcrum. Taking, therefore, the point of the oar in the water, for fulcrum, the equation, which he finds so ridiculous, gives the true relations between the power exerted by the hand, and the pressure on the row-lock. He will hardly deny that there is a pressure on the row-lock. If he does, I would earnestly recommend him to put his finger between the oar and the row-lock, next time he finds himself again in a boat, and I will be bound for it that he will remember the lesson he so receives till the day of his death. Now, what I proved by my equation, was this—that you get the very same relations between any two of the

forces applied to an oar (for, however much it may appear a solecism to Mr. Cheverton, there are, undoubtedly, three forces applied to an oar and to a lever of any kind) take the moments from what point you will.

Mr. Cheverton, however, tries to prove that this equation is wrong by a *reductio ad absurdum*, and discovers that, if the rower attempt to move the boat, by applying his power at the row-lock, the propelling power is equal to the power exerted by him. He *unconsciously* furnishes the correct answer to this, by stating that the oar in that case ceases to be a lever. In fact, there is in that case no *resistance of the water which is essential to the motion of the boat*, as I showed before. If he had known how to deal with considerations of this kind, he would not require now to be told by me that taking the row-lock for fulcrum, and obtaining the equation

$$Pa = Q\,b.$$

If the hand move up to the row-lock $a = o$, and, therefore, since P and b are finite, $Q = o$. The oar in this case becomes practically part of the boat, and the pressure on the row-lock and the power exerted by the hand are *internal forces*.

Mr. Cheverton, it seems, has yet to learn that a rod or oar, in order to act as a lever, must be subjected to the conditions of a lever. Moreover, if he had any real knowledge of "work," he would have known that the work developed by the power being *nil*, the work done in propelling the boat is *nil* also.

The only glimmering of sense in Mr. Cheverton's letter, is the paragraph in which he speaks of the case of uniform motion; but, as I have amply discussed this question in the body of my letter, I shall not now resume it.

Of course I am not concerned to defend the errors of quasi-mathematicians. No one has written more earnestly than myself against the folly of trusting in equations, simply because they are *equations*.

With all sound theorists, mathematical symbols, unless they represent physical conditions, are "naught." But I deny, most emphatically, that there is any discrepancy between sound theory and sound practice. I do not wish to palm myself off on the world for what I am not. I do not profess to have worked in collieries, or steam factories, or tin mines, or to have manufactured engines. But, I do profess to have made "practical" mechanics—not, be it observed, the mechanics of self-styled "practical men" (Heaven bless the mark!) —my study. I am well acquainted with the calculations which are the guides to sound practical engineers in the exercise of their profession. And this I will say, that anything more unlike what Mr. Cheverton advocates, I cannot conceive.

Mr. Cheverton hugs himself with the comfortable belief that "he has brought me to grief." I do not wish to disturb him in that hallucination. Of this, however, I am thankful—that I have never committed myself to such an absurdity, as declaring that "mathematical conceptions can be true theoretically, and even *physically* (that is, in the cases presented by nature) with regard to the inherent nature of force" and yet "unreal as to the outward form and manifestation"—that I have never drawn a distinction between "abstract" forces and "concrete" forces.

I would seriously recommend Mr. Cheverton, before he again takes up his pen to write on mechanical questions, to advance beyond the first pages of some popular treatise. He says that he *cannot* receive instruction from me. As he tells us he took part in a discussion in your pages, twenty years ago, I think it very probable that this is the case. But if he cannot learn, the best course he can pursue is to maintain silence.

In conclusion, I repeat, that the true historical and "practical" meaning of the word fulcrum is, that "point in a lever which is supposed *fixed*, about which it is capable of turning in all directions;" and that it has no proper application in the case of a locomotive engine. I have amply shown in my letter, to which this is a postscript, that "mathematicians" have no difficulties in discovering and dealing with the true effects of all forces, whether of the nature of motive powers, or resistances, and that the lugging in the notion of levers and fulcrums has, undoubtedly, a tendency to create confusion instead of clearness of conception, as is, in fact, most amply and aptly illustrated by Mr. Cheverton's letters.

April 14, 1856. W.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Mueller, C. G. *Certain new and useful improvements in locks for doors.* Patent dated September 4, 1855. (No. 2001.)

The patentee describes an arrangement of parts which cannot be explained without reference to drawings.

De la Rue, W. *Improvements in treating Burmese naphtha when obtaining products therefrom.* Patent dated September 4, 1855. (No. 2002.)

This invention consists in subjecting Burmese naphtha to the action of free steam at about 212° F. to drive off the more volatile constituents, and so as to produce a

residue that may be used, either alone or in combination, for lubricating machinery, such residue being purified by means of a dilute acid, and afterwards with weak solutions of alkalies. The acid combines with substances of an alkaline nature, and produces valuable products.

GILBEE, W. A. *Improvements in the manufacture of glass.* (A communication.) Patent dated September 4, 1855. (No. 2003.)

This invention consists in the substitution of certain described coke ovens for the ordinary kilns employed in the manufacture of glass, porcelain, &c.

MOREL, A. *Certain improvements in machinery for preparing fibrous materials to be combed or spun.* Patent dated September 4, 1855. (No. 2004.)

This invention consists in applying a cylinder provided with needles on its circumference to the ordinary gill box, for the purpose of disentangling and laying parallel the fibres, previous to their being combed or spun.

SOUTHWELL, W. *Certain improvements in machinery for grinding or polishing saws and other articles.* Patent dated September 4, 1855. (No. 2005.)

This invention comprises a combination of mechanism for adjusting and working two grindstones, for grinding the opposite faces of circular saws simultaneously—a certain saw mandril for grinding a saw up to the central hole—and a method of giving rotary motion to the saw, during the grinding, by means of friction rollers, &c.

BULL, J. H. *Improvements in fountain inkstands.* Patent dated September 4, 1855. (No. 2006.)

This invention consists in so constructing a fountain inkstand that the contents of the fountain cannot run out through the service cup, even if the stand be upset, and that all the ink in the fountain will, by its gravity, supply the service cup until the fountain is empty, without the stand being moved; and in order to prevent the overflow of the service cup through expansion, a chamber is provided, into which the ink passes when expansion takes place, running back into the fountain when contraction ensues.

CRAYMER, W. *Improvements in propelling vessels.* Patent dated September 5, 1855. (No. 2008.)

The inventor describes an arrangement for feathering and adjusting the blades of screw propellers, by means of cogged quadrants, &c. On turning a handle, motion is communicated by means of a screw to a quadrant on the shaft, thence to a certain cogged-wheel, then to certain float quadrants, and finally to the floats or blades.

COLLIER, G. *Improvements in the manufacture of carpets and other piled fabrics.* Patent dated September 5, 1855. (No. 2009.)

These improvements relate to employing two shuttle-boxes to each side of the loom, separated from and operated independently of the middle of the batten or lay when two shuttles are used, suitable for different thicknesses of weft, either of such shuttle-boxes on each side of the loom being capable of acting with, and for the time of being locked to, the middle part of the batten or lay, whereby those shuttle-boxes for the time in use will, at the traverse of their shuttle, partake of the motions and operate as part of the centre part of the batten or lay. Also, to the application of separate weft-forks to each shuttle-box, to act also in tightening the weft between the work and the shuttles, and thereby improve the selvages of the fabric. Also, to the application therewith of independent picking motions to, and selecting for the picking of the shuttle for the time to operate. Also, to adjusting the motions of the instrument which aids to keep the point of the wire in the deep part of the shed to the different elevations of the work when operating with the respective shuttles.

PALMIÉRI, A. and J. B. FERARI. *A new system of construction of ships or vessels.* (A communication.) Patent dated September 5, 1855. (No. 2010.)

This invention consists in propelling boats or other vessels by means of hollow cylinders furnished with paddles on their circumference, the axes of which cylinders work in suitable bearings. The cylinders are also provided with pulleys, cranks, or toothed wheels, which are put in motion by means of steam or other motive power.

GLASSFORD, J. H. *Improvements in printing textile fabrics and other surfaces.* Patent dated September 5, 1855. (No. 2011.)

The invention consists of a mode of producing by means or with the aid of the lithographic and zincographic systems of printing, or modifications thereof, the undersunk or projecting surfaces or figures of cylinders, blocks, plates, or other printing implements capable of having such surfaces or figures produced thereon, which are to be used for writing or ornamenting the surfaces of textile fabrics, paper hangings, and other surfaces in colours, in a similar manner to the ordinary cylinder and block systems of printing used by calico and silk printers.

PEACOCK, G. *Improvements in shipbuilding.* Patent dated September 5, 1855. (No. 2012.)

The object of this invention is—1. To enable ships to keep a better wind and prevent lee-way and rolling, and consists in

applying to the ordinary fixed keel a horizontal keel, extending on either side beyond the ordinary keel. 2. In constructing the stern of an iron ship with a hollow or boxed stern-post, tapering gradually below the line of the screw-shaft towards the junction of the keel, and conveying a bent pipe from a water-tank or reservoir, for the supply of the boilers through such hollow stern-post. The bent pipe is passed out of the ship above the deep load line, and descends down, so that its outlet is below the light water line. The pipes by which the water is blown from the boilers are to be conducted through the said stern-post in like manner, so as to blow off either through the outer bend of the first-mentioned pipe, or by separate pipes. These pipes are provided with cocks for the purpose of closing the passages when necessary.

MARTIEN, J. G. *Improvements in roasting, calcining, oxydizing, and subliming metallic and mineral substances, and in the apparatus and means to effect the same.* Patent dated September 5, 1855. (No. 2013.)

This invention mainly consists in applying steam through and amongst such substances when being so treated; and in certain means of applying streams of air to and amongst such substances when being so treated.

NETTLESHIP, I. *An improved spindle for the spinning of silk or other fibrous material.* Patent dated September 5, 1855. (No. 2014.)

The inventor constructs a mixed metal spindle, of about six or seven inches in length; it is hollow, and works upon a fixed stud, and consequently may be driven rapidly. Its construction is such as to allow at least double the number (of the common spindles) within the same space. A provision is made to protect the oil in the step of the spindle from dirt; and this step is let into a solid bar attached to the mill.

SCHWARTZ, T. *An improvement in heating or cooling aëriform and liquid bodies.* Patent dated September 6, 1855. (No. 2016.)

This invention consists in increasing the surfaces of cooling vessels by producing on them grooves, ridges, ribs, &c.

ASTON, C. P. *Improvements in breech-loading arms.* Patent dated September 6, 1855. (No. 2017.)

This invention consists in welding, brazing, or otherwise fitting or forming on to the barrel and at or near the breech end thereof a bolt or solid piece, which, passing through the bed on which the barrel is swivelled or raised, and being there locked, takes off the shock consequent upon the discharge. Also, in adapting to the extreme breech end of the barrel a conical plug, which is held upon a rod or lever centred upon a pin in the back end of the bolt hereinbefore mentioned as being fixed to the barrel. Upon the barrel being returned to its bed, after reloading, the plug becomes thrust into the end of the barrel and tends to prevent the escape of any gases generated on the discharge. When loading, the rod or lever to which the plug is attached is drawn back by the finger and thumb, and the charge may be inserted into the barrel.

PRYSE, C., and P. CASHMORE. *Certain improvements in repeating fire-arms.* Patent dated September 6, 1855. (No. 2018.)

This invention consists—1. Of an improved construction of repeating fire-arms, having a double action, and being cocked, either by means of the trigger, or by the use of a thumb-piece on the hammer, and in making the body frame of this arm in one piece of metal. 2. In certain modifications of the above, which may be termed single-action repeating arms. 3. In improved means of applying lever ramrods, for the purpose of ramming the charge in those repeating arms which consist of a cylinder or series of chambers, revolving in a line parallel to the line of a stationary barrel, through which barrel all the chambers of the breech cylinder are discharged. 4. In improvements in the spring catches employed for securing the ramrod close to the barrel when not in use. 5. In improved forms of a double-acting bolt, which will prevent the chambers from revolving, and at the same time secure the hammer or striker at half-cock.

FRASER, J. *An improvement in the manufacture of paper.* (A communication.) Patent dated September 6, 1855. (No. 2019.)

The invention consists in making paper from straw by the following process. An alkaline ley is prepared by dissolving 1 lb. of soda or potash in 2 gallons of boiling water, and then adding 1 lb. of lime in small quantities, keeping the mixture stirred and boiling for an hour after the lime is added. Salt is then added in the proportion of about ¼ lb. to 100 gallons of the mixture. As much as the liquor will saturate is now placed in the vat, and boiled for three or four hours (or the straw may be steeped in the liquor, when cold, for 24 hours.) The straw is next taken out of the vat, drained, and well washed with water, after which it is ready to be ground into pulp.

GILBEE, W. A. *An improved process and apparatus for the purification and clarification of oils.* (A communication.) Patent dated September 6, 1855. (No. 2020.)

The oil is first agitated for about an hour in an agitator, and is thus separated into its constituent parts (grease, mucilage, stearine, and pure oil), and after standing twenty-four hours is drawn off into a reser-

voir. It is then submitted to the pressure of compressed air from an air reservoir, which forces it into a filter provided with the purifying material, prepared and enclosed in a canvas bag adapted to the sides of the apparatus, through which the oil is forced to the upper part. After the oil is admitted to the reservoir a cap should be screwed on, so as to close the vessel air-tight. The filtering material is pumice-stone reduced to a fine powder, and sifted and mixed with oil of a similar kind to that to be filtered, as clear as possible. A soft paste is made, which is spread evenly on the canvas, about one-third of an inch in thickness.

LOWRY, G. *Improvements in machinery for heckling flax and other fibrous material.* Patent dated September 7, 1855. (No. 2021.)

This invention consists—1. In so attaching the heckle bars to the endless sheets, or chains of sheet-heckling machines, that the teeth of the heckles shall enter the fibrous material at, or nearly at, right angles to the same, and closer to the holder than in the machines now in use. 2. In a mode of constructing the holders, in which the stick of fibrous material is held during the operation of heckling, to facilitate the operation of reversing the position of the stick. 3. In an improvement in the construction of the heckle-bars whereby their weight is diminished and strength increased. 4. In making heckle-bars of malleable cast-iron.

GARAND, F. *Improvements in machinery for cutting veneers.* Patent dated September 7, 1855. (No. 2023.)

This invention consists of machinery for cutting veneers by means of a certain plane-bit or knife, so as to avoid the waste which results from sawing off the veneers.

BROOMAN, R. A. *An improvement in casting mortars, cannon, and other hollow articles.* (A communication.) Patent dated September 7, 1855. (No. 2024.)

A description of this invention was given on page 347 of our last No.

STEWART, J. *Improvements in the construction of steam-boilers for the more effectual consumption of smoke.* Patent dated September 7, 1855. (No. 2026.)

This invention consists in forming a passage connecting the furnaces, where more than one is used, so that the smoke from the fresh fuel in one furnace shall pass over the incandescent fuel in the other. Suitable dampers are provided.

M'INTYRE, J. *Improvements in apparatus for caulking decks, ceilings, and floors.* Patent dated September 7, 1855. (No. 2027.)

This invention relates to a self-acting caulking machine, which consists of a cast-iron carriage travelling on four running wheels, and carrying a transverse shaft, fitted with a spur wheel, and cams which actuate the caulking tools. These tools are guided on brackets, over the seams to be caulked. They are in the form of wheels with sharp edges, and are made to guide the machine in the line of the seams, whilst the carrying wheels of the machine are made to guide the oakum into its place in the seams. The machine may be fitted with a pitch kettle for paying the seams with pitch as fast as they are caulked. The machine is moved forward by a rope or chain wound round a barrel on one of the shafts of the machine.

DAMERON, L. *Improvements in the construction of carriages.* Patent dated September 7, 1855. (No. 2028.)

This invention consists in constructing a carriage convertible, first into a landau with four places; second into a landau with two places; and third into an open carriage with four places. The number of places may be increased by increasing the width of the body of the carriage.

HART, H. *Certain improvements in the manufacture and composition of lubricating and burning oils.* (A communication.) Patent dated September 8, 1855. (No. 2030.)

This invention consists in combining fixed oils with crude turpentine, for the purpose of improving them, particularly when they are to be used for lubricating or burning. The patentee takes seven gallons of lard oil, or other good fixed oil, and one gallon of crude turpentine, as it is obtained from the pine tree, and brought to this country, and mixes them, stirring them together until the turpentine is perfectly dissolved in the oil; and, when necessary, the mixture is warmed or heated, to facilitate the mixture and solution.

RASCOL, E. H. *An improved fastening for articles of wearing apparel, and for other purposes, as a substitute for buttons.* (A communication.) Patent dated September 8, 1855. (No. 2031.)

This fastening consists of a stud, having one head or end smaller than the other, which is rounded and adapted for entering a metal eyelet hole, of the ordinary kind. Metal eyelets are placed in each of the two parts that are to be fastened, which are placed together, and the stud pushed through both. The rounded head of the stud has two cross slits formed in it, which pass down the neck of the stud, and as far as the larger head. The rounded and entering head is thus separated into four parts, which may be compressed together to the extent of the slits, when it is passed through the eyelet hole, and expand again when through the eyelet, thus giving security to the fastening.

FEATHER, R. B. *Improvements in the make and construction of shells and balls to be used with cannon, or other artillery, or fire-*

arms. Patent dated September 8, 1855. (No. 2032.)

In this invention the apex or top of each shell is to be made either round or conical, and if armed, then it is proposed to attach to it solid metal points or spikes of any required length, or to convert the interior either wholly or partially into a cavity or magazine, with cover to contain one or more round shot, or a charge of grape or canister, or other missiles.

HELMSLEY, T., and W. HELMSLEY. *Improvements in the manufacture of fabrics in warp and twist lace machines.* Patent dated September 8, 1855. (No. 2035.)

This invention has for its object the manufacture of peculiar fabrics in warp and twist lace machines, and consists in applying chenille or woven weft, either plain or according to pattern, in the fabrics produced in such machines. Heretofore, when using chenille or woven weft in the manufacture of piled fabrics, whether the pile has been brought up on one or both sides, it has been usual to weave the same by opening sheds in the warps by the harness of a common loom, and to introduce the chenille or woven weft into such sheds. These improvements consist in employing warp and twist lace machines in making such classes of piled fabrics, whereby in the fabrics produced in warp lace machines the chenille or woven waft will be tied into the fabrics, which are produced by looping the warp threads into each other; and in the fabrics made by twist lace machines, the chenille or woven weft will be tied into the fabrics by means of the warp and bobbin threads.

DURANT, A. H. A. *Improvements in apparatus for raising and lowering weights, and for saving persons and property from fire.* Patent dated September 8, 1855. (No. 2036.)

These improvements consist in combining two sets of bars, arranged at right angles to each other, the bars of one set crossing the bars of the other set. At the upper ends of these two series of crossing bars is formed a cradle, and at the lower ends the bars are worked by means of cords, racks, and pinions, or other mechanism, so as to contract them, and thus to elevate the cradle.

BIRD, J. *An improvement in the manufacture of biscuits.* Patent dated September 8, 1855. (No. 2037.)

This invention has for its object the application of vegetable charcoal in the manufacture of biscuits, which, in other respects, are to be manufactured in the ordinary way. The charcoal is to be rendered pure as possible by washing and purifying, and in the ground state is combined with the other ingredients. By this means vegetable charcoal may be employed medicinally, in an agreeable form.

DURANT, A. H. A. *Improvements in apparatus for ascertaining the number of, and distance travelled by, passengers in public carriages.* Patent dated September 8, 1855. (No. 2038.)

A description of this invention will shortly be given.

DURANT, A. H. A. *Improvements in apparatus for sweeping and cleaning chimneys.* Patent dated September 8, 1855. (No. 2040.)

This invention principally consists in applying vulcanized India-rubber or gutta percha to the formation of the flexible connections and elastic parts of such apparatus.

WEBSTER, H. *An improvement in the construction of chronometers, clocks, watches, and other time-pieces.* Patent dated September 8, 1855. (No. 2042.)

The object of this invention is to afford the means of readily detaching the escapement from the trains of wheelwork. It consists in attaching to that part of the plate on which the escapement is usually fitted, a supplementary plate, which is secured to the plate by screws or other means.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

INGALL, G. H. *Certain improvements in railway self-acting signal posts and apparatus connected therewith.* Application dated September 5, 1855. (No. 2007.)

Under the tender of the engine or guard's van is fixed an apparatus which consists of a vertical screwed shaft, capable of being elevated or depressed by means of a handle; to the lower end is fixed a wheel which, on the passage of a train, is lowered sufficiently to strike a boss. Upon the boss being struck a shaft upon which is mounted a pinion is caused to revolve, and rack-work is acted upon, and by means of a wire rope the signal arm is raised to the horizontal position. Upon the same centre upon which the signal arm is fixed, a glass signal apparatus also moves and indicates by means of red and green coloured glasses. In a case, which is filled with oil or other suitable liquid, a spring is placed and fastened to a rod, which rod is a continuation of the rack-work, the piston having valves for the escape of the oil, after being raised by the rack-work. When a train arrives within sight of this apparatus the driver or guard is enabled to tell, by means of the signal-arm, how long since a previous train has passed by day, and by means of the coloured glasses at night.

GODDARD, S. A. *A new or improved method of preventing the injurous fouling of the barrels of fire-arms, and of cleaning the same*

when fouled. Application dated September 6, 1855. (No. 2015.)

The patentee takes a short tube, having the same internal diameter as the barrel to be cleaned. He introduces wads into one end of the tube, so as to constitute a temporary bottom, and fills the tube with tow or wool, impregnated with soft soap, and then closes the top of the tube with wads. In order to clean the barrel of a fire-arm which has been fouled, the caps or lids are removed from the ends of the charged tube, and the usual charge of powder having been introduced into the firm-arm, the said tube is placed upon the end of the barrel, and by the use of a ram-rod, the contents of the tube are forced into the barrel. The loading is completed by the addition of the projectile, and the fire-arm is discharged. On forcing the contents of the tube into the barrel, the soft soap or composition is distributed on the inside of the barrel, and on the discharge of the fire-arm the wadding clears the barrel of any adherent matter.

HAND, S. *An improved combined cake-crushing, oat-bruising, and bean-splitting mill.* Application dated September 7, 1855. (No. 2022.)

This invention consists in an apparatus for effecting the bruising of oats, crushing oil cake, and splitting beans in one and the same machine, which may be driven by hand, and so arranged that either one or two of those operations may be carried on at one time, or the whole simultaneously. Two side frames are provided, between which the bruising rollers or cylinders and the cake-crushing instrument are placed. One of the rollers is placed on the driving shaft, on which the winch handles are placed, the other being mounted at the same level. The splitting mill is also placed on the main shaft, the running surface being fixed thereon, while the stationary splitting surface is fixed to one of the side frames concentric with the main shaft, a suitable hopper and duct being provided to conduct the beans between the splitting surfaces. The cake-crushing instruments are also driven from the main shaft by toothed gear.

TEMPLETON, N., and D. MILLAR. *Improvements in the manufacture of figured fabrics.* Application dated September 7, 1855. (No. 2025.)

This invention relates to the weaving of figured muslins and other ornamental fabrics, by a peculiar combination and action of the ordinary jacquard or other pattern-working apparatus with heddle mounting, these two branches of the weaving details being worked together in weaving the goods.

REYNAUD, L. P. *A new system of endless stair-crane.* Application dated September 7, 1855. (No. 2029.)

This invention relates to a crane for raising and moving stone, &c., which crane is intended to supersede the use of treadmills. It consists of a vertical standard fixed to a moveable frame with wheels, upon the top of which standard is placed horizontally a beam which rotates upon an iron pivot fixed to the top of the standard. This beam is strengthened by a circular support of wood or iron to which is fixed two bars of wood at right angles to each other, each bar having at the end a chain or rope fixed to it for supporting a weight to act as a counter-balance. At one end of the main beam is placed a stone to be lifted. For this purpose a bar of iron is attached to the end of the main beam by a strong hook, and this bar has suspended to it two hooks having an iron rod passing through them, fixed by set screws, so that the weight of the stone causes the hooks to take fast hold of it. Upon the opposite end of this main beam is placed a cart filled with earth or other material to act as a counter-balance to the stone, and enable it to be moved in any position. To the main standard is fixed a ratchet wheel having in gear with it two pawls which are attached to two levers that communicate with an endless staircase, so that a person in ascending or descending causes it to receive a rotating motion which, by means of a rope round a pulley, raises heavy bodies.

TUCK, J. H. *Improvements in dredging and excavating machinery.* (A communication.) Application dated September 8, 1855. (No. 2033.)

In this invention the mechanism is arranged and combined so as to admit of the excavating buckets being discharged as they rise from the bed of the river, and the invention consists in applying thereto a tilting tipper and a self-catch in the buckets, by the combined action of which the buckets are successively emptied while proceeding upward. The tilting tipper turns on a pivot or centre on which it is raised by the ascending bucket, and in falling back again strikes against the tail of the self-acting catch of the bucket, and allows the bottom of the same to fall open by turning on a hinge. The invention also consists in applying to dredging and excavating machinery certain means of keeping the dredging wheel in working gear with the driving engine, while the shaft of the said wheel is raised or lowered.

BOUCHERIE, H. *Certain improvements in machinery for impregnating woods with chemical materials for their preservation and coloration.* Application dated September 8, 1855. (No. 2034.)

The inventor employs an air-tight vessel or chamber, in which the pieces of wood are placed in a vertical position. On the

top of each piece is placed a plate of metal or other material, with a ring or band of caoutchouc to connect it with the wood. The plates are kept in their proper positions by links, connecting them to each other, and to the sides of the chamber. There is a short tube in the centre of each plate, and these tubes are connected by flexible tubes to other short tubes passing through the sides of the chamber. The chamber is closed by a cover, and it has a cock near the top for the escape of air, and another for the admission of the preservative or colouring liquid. A third cock serves for drawing off the liquid.

PROVISIONAL PROTECTIONS.*

Dated March 25, 1856.

702. John Bromley, of Shelton, and William Adams, of Etruria, Stafford. Improvements in ovens used for firing porcelain and other kinds of earthenware.

704. John Aspinall, of Limehouse, Middlesex, civil engineer. Improvements in apparatus for obtaining extracts and decoctions.

706. John Henry Johnson, of Lincoln's-inn-fields, Middlesex. Improvements in machinery or apparatus for raising nap or pile. A communication from Messrs. F. H. Schroer and C. E. Rost, of Meissen, Saxony.

708. George Hallen Cottam and Henry Richard Cottam, of Old St. Pancras-road. Improvements in the manufacture of chairs, bedsteads, and other articles to sit and recline on.

710. George Hedgcombe Smith, of North Perrott, near Crewkerne, Somerset, twine manufacturer. An improvement in the manufacture of saucepans, kettles, and other like culinary utensils.

712. Robert Collins, of Trent, Somerset. An improved agricultural implement.

714. George Wailes, of Palace-row, New-road, Middlesex, engineer. Improvements in the means of actuating valves used for regulating the passage of gas or water in pipes.

Dated March 26, 1856.

715. Matthew Weston and Orlando Carter, of Rochdale, Lancaster. Improvements in machinery or apparatus for setting saws.

716. Joseph Liley, of Gutter-lane, London. An improved case or sliding-tube for candles, telescopes, opera-glasses, and is especially applicable to portable articles for the toilet, in travelling, and is called "Debas-cylindrical-etui." A communication.

717. Alexandre Tolhausen, of Duke-street, Adelphi, London, sworn interpreter at the Imperial Court of Paris. A new process of producing chemical writing, and of marking and inscribing chemically any characters or figures upon paper or other substance of similar character. A communication from Halvor Halvorson, United States.

718. Alexandre Tolhausen, of Duke-street, Adelphi, London, sworn interpreter at the Imperial Court of Paris. An improved mode of manufacturing porous earthenware. A communication from Halvor Halvorson, of Cambridge, Massachusetts, United States.

719. William Armand Gilbee, of South-street, Finsbury, London, gentleman. Improvements in the manufacture of glass. A communication from Monsieur Salmon, of Paris.

720. Thomas Barnabas Daft, of the Irish Engineering Company, Seville Iron Works, Dublin. Improvements in the manufacture of metallic and other bedsteads and articles of metallic and other furniture.

721. David Lowe, of Leicester, mechanic. Improvements in knitting-machinery.

722. George Smith, of Manor-road, Saint Mary's, Newington, Surrey. Improvements in envelopes for containing letters or documents.

723. Patrick Scott Rankin, of Glasgow, Lanark, N.B., cabinet-maker. Improvements in communicating or transmitting motive power.

724. William Robert Barker, of Chapel-street, Middlesex, gentleman, and William Toogood, of Mount-street, glass-dealer. Improvements in bottles, or in stoppering bottles, jars, and other receptacles.

725. James Rock the younger, of Hastings, Sussex, carriage-builder. Improvements in carriages, parts of which are applicable to other structures.

726. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved apparatus for exploring under water. A communication.

727. William Clayton, of Watling-street, London, perfumer and soap manufacturer. An improved manufacture of soap.

728. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in macerating substances to be employed in the process of distillation. A communication.

Dated March 27, 1856.

729. James Taylor and James Galloway, of Bolton-le-Moors, Lancaster, brass founders. Improvements in gauges for indicating pressure.

730. Alexandre Tolhausen, of Duke-street, Adelphi, London, sworn interpreter at the Imperial Court of Paris. Certain improvements in watches and other timekeepers. A communication from Jacob Muma, of Hanover, United States.

731. Joseph Tall, of Islington, Middlesex, gentleman. Improvements in blind rollers, and in fixings for the same.

732. William Nicholls, of Raunds, Northampton, army contractor. An improvement in the manufacture of boots and shoes.

733. Richard Durant Cumming, of St. James's, Middlesex. A foot-stool and hassock combined. A communication.

734. Bonnet Frédéric Brunel, of Hampstead-road, Middlesex, chemist. Improvements in the manufacture of Prussian blue.

735. James Cliff, of Burton-upon-Trent, Stafford, engineer. Improvements in machinery for cleansing casks.

736. William Ball, of Chicopee, Hampden, State of Massachusetts. Improvements in machines for separating copper and other metals from their ores.

737. Allen Levingston Hill, of Birmingham, Warwick, builder. Improvements in furnaces for steam boilers, japanners' stoves, and other such like purposes.

738. Edward Bufton, of Piccadilly, Middlesex, pharmaceutical chemist. An improved ink for marking linen and other fabrics, and in the case or holder for containing the same, and the implements to be used therewith.

740. William Frederick Thomas, of St. Martin's-le-grand. Improvements in sewing-machines.

Dated March 28, 1856.

741. Joseph Auguste Barratte, of South-street, Finsbury, London, civil engineer. A new rotatory steam engine.

742. John Conrad Meyer, of Paris, France, civil engineer. Improvements in the construction of vices.

743. William Ward, of Warrington, Lancaster, spinner and manufacturer. Improvements in apparatus for lubricating the spindles of certain machines, and in preparing and spinning.

744. Alfred Daniel, of Moorfields, Wolverhampton, Stafford, lock manufacturer. Improvements in the manufacture of keys and locks.

745. Joseph Webber, of Torquay, Devon, slate and cement merchant. Improvements in generating steam.

746. John Charritie, of Cannon-street, and William Smith, of Salisbury-street, Adelphi. Improvements in the manufacture of small shot. A communication.

747. James Harrison, of Geelong, Victoria, gentleman, Member of the Legislative Council of Victoria. Producing cold by the evaporation of volatile liquids in vacuo, the condensation of their vapours by pressure, and the continued re-evaporation and recondensation of the same materials.

749. James Harrison, of Geelong, Victoria, gentleman, Member of the Legislative Council of Victoria. Distilling or evaporating in vacuo condensing the vapour by pressure, and economizing heat.

750. Alfred Trueman, of Swansea. Improvements in treating argentiferous regulus.

751. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved air engine for producing motive power by heated air. A communication from J. Ericsson, of New York.

Dated March 29, 1856.

753. Charles Wye Williams, of Liverpool, Lancaster, gentleman. Improvements in the application of air propelling or exhausting apparatus for ventilating and like purposes on board steam-vessels.

755. Francis Puls, of Soho-square, Middlesex, chemist. Improvements in galvanic batteries.

757. Robert Powell, of Peter's-place, St. Martin's-lane, Middlesex, tailor. A new method of making up cotton, linen, silk, woollen, and other textile fabrics, whether waterproofed or not, into wearing apparel, horse clothing, tents, tilts, and all other articles or things for which such fabrics are used, by which method the article or thing when made up and worn is perfectly ventilated.

759. William Muschamp, of The Tyne Paper Mill Company, Gateshead. An improvement in the manufacture of paper in order to render the same waterproof.

761. John McLean, of Glasgow, Lanark, N.B., merchant. Improvements in treating or preparing textile fabrics and materials for increasing the density thereof.

763. William Nimmo, of Pendleton, Lancaster, spinner and manufacturer. Improvements in the manufacture of textile fabrics.

765. Adolphe Guido, of Versailles, France, chemist. Improvements in cleansing, washing, scouring wool and woollen fabrics and yarns.

767. Charles Durand Gardissal, of Bedford-street, Strand, London. An improvement in screw stop-valves. A communication.

WHITWORTH'S APPLICATION FOR PROLONGATION OF PATENT.

The Judicial Committee of the Privy Council has appointed Monday, 16th June next, at half-past ten A.M., for hearing the petition in the above matter.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," April 15th, 1856.*)

2730. John Marsh. Improvements in the manufacture of looped and piled fabrics.

2731. Adam Bullough. An improved lubricator for looms.

2733. William George Plunkett and John Bower. The manufacture of fibres or threads for textile fabrics and cordage, also of paper mill-board and other similar boards from plants or portions of plants not hitherto used for these purposes.

2740. Alfred Vincent Newton. Improvements in apparatus for dressing cloth. (A communication.)

2742. Charles Hawker and Thomas Parry Hawker. An improved method of manufacturing cartridges.

2744. William Mosley. Improvements in machinery or apparatus for stretching and finishing woven fabrics.

2751. Thomas Chaffer and Jonah Ellis. Improvements in machinery for sawing and cutting slate, stone, coal, salt, rock, or other minerals.

2754. Thomas Russell Crampton. An improvement in furnaces, and in apparatus for supplying fuel thereto.

2758. Jean Joseph Emilien François Kuister. Improvements in raw silk-winding machinery.

2762. James Gardner, Henry Gardner, and John Carey Gardner. Improvements in glasses as applied for the transmission of light.

2764. Charles Lenny. Improvements in carriages.

2766. John Allin Williams. Improvements in machinery or apparatus for cultivating land.

2770. Charles Edmund Green. Improvements in huts, tents, and camp hospitals.

2773. Charles François Jules Fonrebert. An artificial leech and a sucker.

2778. Andrew Maclure. Improvements in lithographic printing-presses.

2781. James Cocker. Improvements in the manufacture of wire.

2785. Peter Armand Lecomte de Fontainemoreau. Improvements in obtaining motive power by means of heated compressed air. A communication.

2786. Richard Archibald Brooman. Improvements in manufacturing gas from peat and in treating hydrogen gas in order to render it illuminating. A communication.

2790. Bernard Hughes. A machine for making spokes and tool-handles. A communication.

2791. Bernard Hughes. A knot-tying sewing-machine. A communication.

2793. Jean Marie Préaud. Certain improvements in India-rubber springs.

2805. Robert W. Davis and Daniel Davis. An improved vice.

2806. Martha Billing and Walter George Whitehead. A new or improved waterproof fabric or material.

2807. Isaac Beardsell. Improvements in the finishing of mohair cloths and other textile fabrics, and in the machinery employed for that purpose.

2829. Peter Haworth and Alexander Forrest. An improvement in the manufacture of belts, bands, braces, and other similar articles of wearing apparel.

2843. Samuel Fletcher Cottam. Certain improvements in mules for spinning cotton and other fibrous materials.

2846. Henry Stewart. A machine or apparatus for cleaning and polishing forks, spoons, and other like curved articles.

2876. Robert Walker. Improvements in applying power to, and in machinery for, raising and lowering coals and other articles from and into mines.

2878. Andrew Shanks. Certain improvements in instruments for indicating pressures.

28·8. Jean Baptiste Emile Saffrey. An improved break for railway carriages. A communication.

2891. Bernard Hughes. A mode of mingling the vapour of bisulphuret of carbon and steam, and applying them as a motive power.

2938. George Chisholm. Improvements in the manufacture of artificial manure.

70. Edward Hallen and William Holland Kingston. Improvements in communicating between the guards and engine-drivers, and between the passengers, guards, and engine drivers of railway trains.

142. François Jules Manceaux. Improvements in fire-arms.

280. Francis Best Fawcett. Improvements in the manufacture of carpets.

311. Theodore Bergner. Embossing veneers so as to represent carvings in wood. A communication.

313. James Howard. Improved apparatus for making moulds for castings.

342. Charles Swan and George Frederick Swan. An improved colouring matter for writing, staining, or dyeing, which is also applicable to the production of a copying fluid. A communication.

437. Henry Sherwood. Improved means of treating the spun waste of wool, cotton, silk, flax, hemp, and other fibrous substances, so as to render it suitable for re-working.

537. François Ruslem. An improvement in the manufacture of fuel.

549. Thomas Lambert. Improvements in apparatus for regulating the drawing off of water and other fluids.

569. Richard Archibald Brooman. An improved method of creating a vacuum, together with certain arrangements of apparatus for preserving substances liable to injury or corruption from prolonged exposure to the atmosphere. A communication.

613. James Murdoch. An improved mode of manufacturing cut velvets, and other similar fabrics. A communication.

614. William McCarton. Improvements in the drying of corn or grain for grinding and preserving, and apparatus for performing same, and is applicable to drying of other seeds.

640. Peter Armand Lecomte de Fontainemoreau. Improvements in churns. A communication.

649. Peter Appleton. Improvements in knives for peeling apples, potatoes, and other fruits and roots.

661. Charles Frederick Parsons. Machinery to be employed in the bleaching and dyeing of cloths, yarns, and fabrics.

665. James Wadsworth. Improvements in the ventilation of mines, or in the means of removing noxious gases therefrom, and in machinery or apparatus to be used for that purpose.

666. John Watson Burton and George Pye. Improvements in treating flax, hemp, and other fibrous matters requiring like treatment.

686. John Juckes. Improvements in furnace-bars.

691. James Bryant. Improvements in machinery or apparatus for the re-burning of animal charcoal.

706. John Henry Johnson. Improvements in machinery or apparatus for raising nap or pile. A communication.

707. John Dearman Dunnicliffe and Stephen Bates. Improvements in the manufacture of twist lace and weavings.

708. George Hallen Cottam and Henry Richard Cottam. Improvements in the manufacture of chairs, bedsteads, and other articles to sit and recline on.

719. William Armand Gilbee. Improvements in the manufacture of glass. A communication.

726. William Edward Newton. Improved apparatus for exploring under water. A communication.

731. Joseph Tall. Improvements in blind-rollers, and in fixings for the same.

738. William Ball. Improvements in machines for separating copper and other metals from their ores.

761. John McLean. Improvements in treating or preparing textile fabrics and materials for increasing the density thereof.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

886. Nathaniel Clayton and Joseph Shuttleworth.
889. Thomas Edwards.
895. Charles Clifford.
897. Thomas Lovell Preston.
901. John Chadwick and Thomas Dickins.
912. David Zenner.
917. William Wilkinson.
926. George Albemarle Cator.
928. Henry Wilks.
962. Henry Carr.
967. William Edward Newton.
942. John Chatterton.

LIST OF SEALED PATENTS.

Sealed 11th April, 1856.

2273. William Andrew Fairbairn and George Haslam.
2275. Peter Spence.
2288. James Septimus Cockings, and Ferdinand Potts.
2303. Samuel Kent.
2317. Henry Bessemer.
2319. Henry Bessemer.
2321. Henry Bessemer.
2323. Henry Bessemer.
2325. Henry Bessemer.
2327. Henry Bessemer.
2333. Charles Edwin Jones.
2399. Simon O'Regan.
2423. William Henry Walenn.
2451. Robert Cook.
2481. George Burridge.
2511. Charles Allen Browne.
2653. Charles Sanderson.
2881. Evan Evans.
2883. Philip Antrobus.
2905. Isaac Atkins and Marmaduke Miller.
91. Charles François Leopold Oudry.
121. David Dring.
129. William Chapman.
243. Samuel Palmer Gladstone.
297. Rudolph Bodmer.

307. George Cumins Thomas.
423. William Aristides Vérel.

Sealed 15*th* April.

2302. Thomas Weatherburn Dodds.
2304. Robert Benton.
2310. William Church.
2311. Edwin Wilkinson.
2312. John Forrest.
2314. Théodore Augustin Claeijs.
2329. John Talbot Pitman.
2330. Thomas Taylor.
2331. John Adcock.
2332. Thomas Richards Harding.
2350. Thomas Craven and Matthew Pickles.
2356. Hypolyte Gaudibert.
2370. Thomas Roberts and John Dale.
2448. John Cottrill.
2490. Richard Goose.
2702. Edward Daniel Johnson.
2703. Auguste Dusautoy.
2. Ferdinand Swift.
268. John Barker Anderson.
326. Franklin Prestage.
416. Stephen Fitchew Cox.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

A Subscriber and Glass-cutter.—The "Pocket Painter's Director," price 3s. 6d., published by Bennett, Ivy-lane, London, will probably suit you.

Ch. Claus.—We cannot answer your question. We think the information might be obtained by a search at the Government Patent-office.

Several articles and letters stand over till next week.

CONTENTS OF THIS NUMBER.

On Large Bells and Bell-machinery—(*with engraving*) ... 361
Merchant Shipping Registration Act—(*concluded from page* 343) ... 365
Boiler Explosion at Portsmouth Dockyard—(*with engravings*) ... 369
Fairbairn's Pumping Engine ... 370
Gardner's Patent Smoke-consumer ... 370
Prospects of Steam Culture ... 371
Mechanical Locomotion ... 371

Specifications of Patents recently Filed:
Mueller ... Locks ... 375
De la Rue ... Treating Naphtha ... 375
Gilbee ... Glass ... 376
Morel ... Fibrous Materials ... 376
Southwell ... Polishing Saws ... 376
Bull ... Inkstands ... 376
Craymer ... Propelling ... 376
Collier ... Carpets ... 376
Palmieri & Ferari ... Constructing Ships ... 376
Glassford ... Printing Fabrics ... 376
Peacock ... Shipbuilding ... 376
Martien ... Calcining, &c. ... 377
Nettleship ... Spindles ... 377
Schwartz ... Heating and Cooling Liquids ... 377
Aston ... Breech-loading Arms ... 377
Pryse & Cashmore ... Fire-arms ... 377
Fraser ... Paper ... 377
Gilbee ... Purifying Oils ... 377
Lowry ... Heckling Flax ... 378
Garand ... Cutting Veneers ... 378
Brooman ... Cannon, Mortars, &c. ... 378
Stewart ... Steam Boilers ... 378
M'Intyre ... Caulking Decks ... 378
Dameron ... Carriages ... 378
Hart ... Oils ... 378
Rascol ... Fastenings for Garments ... 378
Feather ... Shells ... 378
Hemsley & Hemsley ... Fabrics ... 379
Durant ... Raising Weights ... 379
Bird ... Biscuits ... 379
Durant ... Raising Weights ... 379
Durant ... Passenger-indicator ... 379
Webster ... Chronometers ... 379

Provisional Specifications not proceeded with:
Ingall ... Signal-posts ... 379
Goddard ... Cleansing Fire-arms ... 379
Hand ... Crushing-mill ... 380
Templeton and Millar ... Fabrics ... 380
Reynaud ... Stair-crane ... 380
Tuck ... Excavating ... 380
Boucherie ... Impregnating Wood ... 380

Provisional Protections ... 381
Application for Prolongation of Patent ... 382
Notices of Intention to Proceed ... 382
Patents on which the Third Year's Stamp-Duty has been Paid ... 383
List of Sealed Patents ... 383
Notices to Correspondents ... 384

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1707.] SATURDAY, APRIL 26, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

LARK'S PATENT SMOKELESS FURNACE.

Fig. 1.

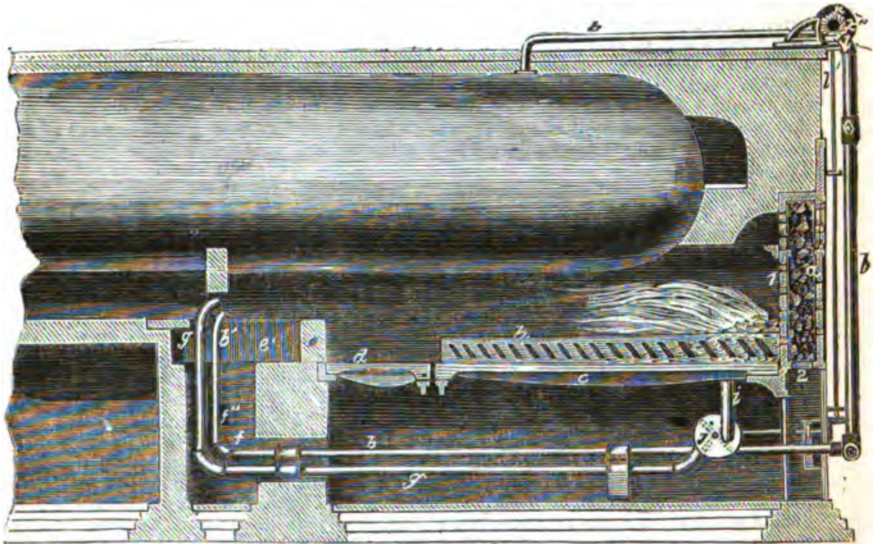


Fig. 3

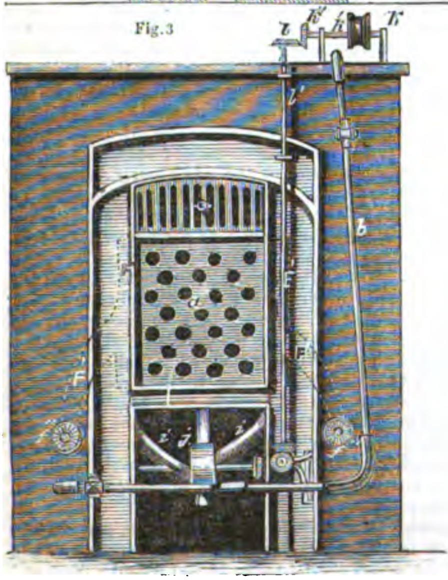
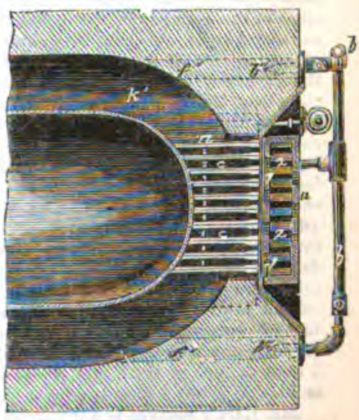


Fig. 2.



LARK'S PATENT SMOKELESS FURNACE.

(Patent dated January 15, 1855.)

Mr. J. P. Lark, foreman to Messrs. Francis, Brothers, cement-manufacturers, of Nine Elms-lane, Vauxhall, has patented an invention, the following description of which is taken from his specification:—"The invention relates to a mode of supplying air to furnaces above the fire-bars, by causing it to pass in numerous streams through a chamber containing ignited fuel, by which it becomes highly heated before passing into the furnace; also, to a mode of supplying a jet or jets of steam behind the furnace bridge, or at the back end of the furnace, in combination with heated air; and also, to forming the fire bars in two lengths, the hinder portion being shorter than the front, and the spaces between such hinder bars being wider, so as to admit more air to pass between them than between the front portions of the said bars.

"The chamber for the reception and combustion of fuel for heating the air passing into the furnace I form on the inside of the fire door, or in other convenient situation, and through the back and front of such chamber I form numerous holes for the passage of air, which thereby becomes highly heated in passing through such chamber to the furnace. The steam is conducted amongst the heated air supplied to the back end of the furnace by suitable pipes, and the fire bars are arranged as hereinafter described.

"Fig. 1 shows a longitudinal section, fig. 2 a plan, and fig. 3 an end view of a steam boiler furnace with my improvements applied. *a* is the fire door for the supply of fuel to the fire-place; it has an internal plate, 1, which, with the door itself, is perforated with numerous holes, so as to admit through it numerous streams of air to aid the combustion of the fuel on the fire bars, somewhat as has heretofore been practised. But in carrying out improvements, I form the space between the door, *a*, and the plate, 1, into a chamber for the reception and combustion of fuel, there being bars, 2, by which such fuel is supported in the chamber. The air passing into the furnace through the door is thus caused to pass through a chamber of ignited fuel, by which it becomes highly heated before passing amongst the fuel on the fire bars, and the consumption of the products of combustion without producing smoke is thereby greatly facilitated. *b* is a pipe conveying steam from the boiler, for the purpose hereinafter explained. The fire bars to the furnace are divided into two parts, *c* and *d*; those forming the hinder portion, *d*, being shorter than the front portion, *c*, and the spaces between the bars, *d*, being wider, so as more freely to admit of air passing between them than between the bars of the front portion, *c*. *e* is the furnace bridge, behind which are a series of fire bricks, *e'*, placed so as to leave spaces between them for the passage of heated air up from the chamber, *f*, and that conveyed by the pipe, *g*, as also for jets of steam from the pipes, *b'*, in connection with the steam pipe, *b*. The air admitted from the chamber, *f*, is supplied to that chamber from passages, *f'* (one or more on each side of the furnace), by which the air in passing to the chamber, *f*, through the openings, *f''*, becomes heated. Upon these openings, *f''*, are placed regulators, to regulate the amount of air admitted to the chamber, *f*. I also form chambers, F, opposite the edges or sides of the chamber in the furnace door, with communications therefrom by channel, F', to the passages, *f'*, when, by perforating those parts of the said chamber next the chamber, F, heated air will also pass from the furnace door chamber to the passages, *f'*, thence by the chamber, *f*, to the back of the furnace. Steam is also admitted to the passages, *f'*, by the pipes, *b''*, from the pipe, *b*. The air supplied by the pipe, *g*, is fed from the interior of the fire-place, there being openings therefrom through the plate, *h*, to chambers, *h'* (one on each side of the furnace), and thence by the passages, *i*, to the fan or blower, *j*, by which such air is forced forwards through the pipe, *g*. Motion is communicated to the axis of the fan or blower from a steam engine or other suitable power by a strap or band acting upon the pulley, *k*, affixed to the axis, *k'*, which turns in suitable bearings, as shown, and has affixed to it the bevilled pinion, *k''*, which takes into and drives the bevilled pinion, *l*, upon the axis, *l'*, upon the lower end of which is affixed a bevilled pinion, which takes into and drives a bevilled pinion upon an axis, upon which is affixed another bevilled pinion, which takes into and drives a pinion upon the axis of the fan or blower. The heated air thus caused to pass up in divided streams, combined with jets of steam at the back end of the furnace, is introduced among the products of combustion, and facilitates their consumption. In some cases, especially where small furnaces are used, as in the heating of ovens or kilns, I omit the use of the heated air as withdrawn from the fire-place and propelled by the fan or blower, *j*, but I then employ a closed ash-pit."

Mr. Lark's furnace is not without eulogists. In *The Cyclopædia of Receipts*, &c., we find the following:—"This" (the admission of heated air both through the door and at the back or bridge of the furnace) "is the principle of 'Lark's Patent Smoke Burner,' approved by the Government inspectors, and almost invariably mentioned by them, when

parties summoned to the police courts state their inability to apply a remedy. This invention is now in successful operation upon numerous steam furnaces with boilers variously constructed. It has also been extensively tested for the furnaces of coke ovens, bakers' ovens, potteries, and chemical works, and appears equally adapted to them all; whilst from the extreme liberality of the proprietors of the patent ('The Smoke-burner Company,' Nine Elms), as to charge for license, and the small cost of its application, it is placed within the reach of every manufacturer and tradesman. The bakers, especially, a class of men who have been recently bewailing the extreme difficulty and hardship of their case, have here a cheap and easy remedy."

FARADAY'S EXPERIMENTAL RESEARCHES IN ELECTRICITY.

(*Continued from page 319.*)

Faraday's notions of "lines of magnetic force" will have been made as clear, probably, by the paper quoted in our last article, as by any other of the numerous definitions and illustrations which he has given of them. These "lines" are, in short, nothing more than what are commonly called "magnetic curves," such as are exhibited by the action of a magnet or iron filings. It is plain to every one who can think clearly on the subject for a few moments, that these curves or lines have no existence *per se*; they are simply the lines in which *the iron filings* arrange themselves when acted upon by the magnet. These "lines of force" have no more peculiarity in them than the ellipses in which the planets move, or the curve described by a projectile, or, in short, any other line described by a body under the action of any force, or the position of equilibrium taken up if there be no motion. It would never have entered into the head of any mathematician to imagine that there was anything more peculiar or wonderful in these magnetic curves than in any other curve. He would just as soon think of ascribing an independent existence to the curve described by the earth round the sun, or to the curve (the catenary) in which a chain or rope hangs when suspended by its two ends. It would be just as absurd to talk about this latter curve (the catenary) as "the representative and exponent" of gravitation, as to talk about the "magnetic curves" as "the representatives of magnetism;" yet this is what Faraday does in almost every page of his book. In the abstract of his lecture at the Royal Institution (copied in our last article) he says, "These phrases (or lines of force) have a high meaning, and represent the ideality of magnetism. They imply not merely the directions of force, which are made manifest when a little magnet, or a crystal, or other subject of magnetic action is placed amongst them; *but those lines of power which connect and sustain the polarities, and exist as much when there is no magnetic needle or crystal there as when there is, having an independent existence, analogous to (though very different in nature from) a ray of light or heat; which, though it be present in a given space, and even occupies time in its transmission, is absolutely insensible to us by any means whilst it remains a ray, and is only made known through its effects when it ceases to exist.*"

We doubt whether a more absurd and preposterous sentence occurs in any book written since the middle ages. The blindest follower of the scholastic systems of "occult qualities," and unintelligible metaphysical jargon, could not have written anything more thoroughly unphilosophical and nonsensical than the above remarks. How any man of common sense in this nineteenth century—to say nothing of an "experimental philosopher"—could ever have seriously given utterance to such stuff, is to us a matter of the deepest astonishment. We regret exceedingly to use such terms in speaking of a man whom we so greatly respect on many accounts; but truth compels us to say that his notions about these "lines of force" really appear to us to amount to a positive *monomania;* for it is almost impossible to believe that any *sane* mind could entertain such views. As to *arguing* against these extraordinary notions, one might as well argue with a German transcendentalist on some unintelligible gibberish of *his* "philosophy." It is enough to say that these "lines of force" have no existence except as any other curved lines; that a "ray of light" or of "heat" has no *separate* existence apart from the subject-matter of which they consist. Magnetic curves are nothing more than the curved lines in which iron or steel filings arrange themselves under the influence of the magnet, and would *not* "have an independent existence" if the said iron filings were removed. As to these "lines" or curves "connecting and sustaining the polarities," it is simply utter nonsense.

The way in which Faraday writes about "*Space*" is equally strange and absurd. Here are one or two extracts to show the queer ideas in which our philosopher indulges on this subject.

"Neither can space be supposed to have those circular currents round points diffused through it, which Ampère's Theory assumes to exist around the particles of ordinary magnetic matter, and which I had for a moment supposed might exist in the contrary direction round the particles of diamagnetic matter. The imagination, '*restrained by philosophical considerations*' (*!*) fails to find any thing in pure space about which the currents could circulate, or to which they could by any association be attached," &c., (p. 195). We should think so! But what the "philosophical considerations" have to do with it, is more than we can even "imagine."

Again: "These lines (of force) proceed through space with a certain degree of facility, of which a general idea may be gained from ordinary knowledge, or from experiments and observations formerly made.(?) Whether there are any circumstances which can affect their passage through mere space, and so cause variations in their conditions; whether variations in what has been called the temperature of space could, if they occurred, alter its power of transmitting the magnetic influence, are questions which cannot be answered at present, although the latter does not seem to be entirely beyond the reach of experiment. This space forms the great abyss into which such lines of force as we are able to take cognizance of by our observing instruments, which issue from the earth, proceed, at least all parts of the globe, where there is a sensible dip." (pp. 221, 222). To talk about the "temperature" of "*mere* space" is mere nonsense. Space is not a material substance and therefore cannot have either "temperature" or any other such property belonging to material substances only.

In another place he talks about some of these "lines of force" in pure space, affecting *other* lines of force in space, (p. 264.) "In space," he adds, "I conceive that the magnetic lines of force, not being dependent on, or associated with matter, would have their changes transmitted with the velocity of light, or even with that higher velocity or instantaneity which we suppose to belong to the lines of gravitating force, and if so, then a magnetic disturbance at one place would be felt instantaneously over the whole globe." Here, again, we have the extraordinary notion of a self-subsisting "line of force" in pure space devoid of all matter: and not only so, but the additional absurdity of supposing one of these non-entities affecting other similar non-entities with a practical effect on the magnetic needle!!! The "lines of gravitating force" which Faraday here talks of, are just as chimerical and purely imaginative on his part, as the magnetic "lines of force." No such idea as that here imagined of "lines of gravitating force" ever entered the head of any mathematician since the time of Newton. It is all a pure fiction—and a very absurd fiction too. Faraday's ideas on these "lines of force" are altogether purely imaginary, and utterly repugnant to every sound and rational view of matter and force. A *force* can never be *represented* by a line *except in relation to other forces of the same kind*; and then only in *magnitude* and *direction*. In the "parallelogram of forces," for instance, one side of the parallelogram may represent the direction and magnitude of one force, and the other side the magnitude and direction of the other force, but only in this way, viz.: Whatever *number* of units of *weight* (*pounds* for instance) there are in one force (represented by the line AB), so many units of *length* (feet, or inches, for example) there are in the line AB. We compare the *ratio* of one weight (or force) to *another weight* (or force) by another *ratio*, that, viz., of a certain straight line to another straight line, and again this last ratio is equal to that of the two *numbers* (of inches, feet, or whatever the unit of length may be). But a *line* cannot represent a *force*, except in this manner. Faraday attaches peculiar importance to the fact of these "lines of force" being *curved* lines, as if the magnetic forces must therefore be exerted *in* these peculiar curved lines, and in a manner different from the action of central forces—such as gravitation, which is exerted in *straight* lines from the attracting to the attracted body. This has always been a favourite crotchet with Faraday, who fancied he had made a grand discovery a long while ago—that, namely, of "induction in curved lines." We quote the following passage from the first volume of his "Experimental Researches."

"(1215.) Amongst those results deduced from the molecular view of induction, which, being of a peculiar nature, are the best tests of the truth or error of the theory, the expected action in curved lines is, I think, the most important at present; for, if shown to take place in an unexceptionable manner, I do not see how the old theory of action at a distance and in straight lines can stand, or how the conclusion that ordinary induction is an action of contiguous particles can be resisted." (Page 380.) In this passage, two perfectly distinct things are mixed up and confused; viz., "Action *in straight lines*," and "action *at a distance*." It may be very true, that electrical action, or induction, does *not* occur except by the intervention

of "contiguous particles:" it may be that electrical and magnetic forces cannot produce any effect on a distant body, except by an intermediate action on the particles which lie between the source of action and the body on which the effect is produced. But what has this to do with the disproving of "action in *straight* lines?" A musical instrument, or any other *sounding* body, produces a certain effect on distant bodies, and by means of the intervening particles of air (to which action, if we please, we may give the name of "induction of contiguous particles"); but there is no "action in *curved* lines" here; the force of one particle of air on the adjacent particles being exerted in the straight lines joining them. In the same way a ray of light may be (and most probably is) propagated by the action of "contiguous particles" of the æther: but this action will doubtless be found to consist of the mutual repulsions of the particles of the æther, exerted *in straight lines*. Faraday does not appear to see, that not only *curvilinear motion* may be produced by forces which act in *straight* lines: but also, that a certain number of particles may be brought into a *curvilinear arrangement* by the action of forces in *straight lines*. It is difficult for any one who has studied even the rudiments of mathematics and mechanics, to believe that a man of Faraday's eminence can labour under such erroneous notions; but such appears to be the case from the very strange way in which he is continually writing about these "lines of force," and "induction in curved lines."

With regard to the "magnetic curves" or "lines of magnetic force," the reader will find an article on them in a former volume of this Magazine (vol. xlv. page 206), where the peculiar form of the curves is deduced from the action of the two poles of the magnet, exerted *in straight lines*.

We really feel it to be almost a waste of time to argue any longer about such a simple and evident matter, and in the case of any man less eminent than Faraday, we should not deem the opinions so strangely put forward worth notice or refutation. But the influence and example of one so justly celebrated as an experimentalist are likely to be extremely injurious on this point. In fact, he has already infected several writers on these subjects with his notions about the peculiar virtues of "induction in *curved* lines" and "lines of magnetic force." Some even of our best experimenters have adopted these erroneous and mystical views. We scarcely, indeed, know *how much* of this is to be attributed to the example and authority of Faraday, for there has always been a great deal of mystical jargon talked and written on the subject of magnetism. The following extract from the article on "Magnetism" in Professor Robison's "Mechanical Philosophy" (vol. iv. p. 265, &c.,) not only gives the true explanation of "magnetic curves," but shows what erroneous views had been hitherto prevalent about them. "Suppose a vast number of small bits of iron, each shaped like a grain of barley, a little oblong. Let them be scattered over the surface of a table, so near each other, as just to have room to turn round. Let a magnet be placed in the midst of them. They will all have magnetism induced on them in an instant; and such as are not already touching others, will turn round (because they rest on the table by one point only), and each will turn its ends to the ends of its neighbours; and thus they will arrange themselves in curves, which will not differ greatly from true magnetic curves (because each grain is very short) issuing from one pole of a magnet, and terminating in the other. Does not this suggest to the reflecting reader an explanation of that curious arrangement of iron filings round a magnet, which has so long entertained and puzzled both the philosophers and the unlearned, and which has given rise to the Cartesian and other theories of magnetism? The particles of iron filings are little rags of soft iron torn off by the file, and generally a little oblong. These *must* have magnetism induced on them by a magnet, and while falling through the air from the hand that strews them about the magnet, they are at perfect liberty to arrange themselves magnetically; and *must therefore so arrange themselves*, forming on the table curves which differ very little indeed from the true magnetic curves. Suppose them scattered about the table, before the magnet is laid on it. If we pat the table a little, so as to throw it into tremors, this will allow the particles to dance, and turn round on their points of support, till they coalesce by their ends in the manner already described. All this is the genuine and inevitable consequence of what Dr. Gilbert has taught us of induced magnetism. It must be so, and cannot be otherwise. *This curious arrangement of iron filings round a magnet is therefore not a primary fact, and a foundation for a theory, but the result of principles much more general.* Most of our readers know that this disposition of iron filings has given rise to the chief mechanical theories which have been proposed by ingenious men for the explanation of all the phenomena of magnetism. An invisible fluid has been supposed to circulate through the pores of a magnet, running along its axis, issuing from one pole, streaming round the magnet, and entering again by the other pole. This

is thought to be indicated by those lines formed by the filings. The stream running also through *them*, or around them, arranges them in the direction of its motion, just as we observe a stream of water arrange the float-grass and weeds. It would require a volume to detail the different manners in which those mechanicians attempt to account for the attraction, repulsion, and polarity of magnetic bodies by the mechanical impulsion of this fluid. Let it suffice to say, that almost every step of their theories is in contradiction to the acknowledged laws of impulsion. Nay, the whole attempt is against the first rule of all philosophical discussion, never to admit for an explanation of phenomena the agency of any cause which we do not know to exist, and to operate in the very phenomenon. We know of no such fluid, and we can demonstrate that the genuine effects of its impulsion would be totally unlike the phenomena of magnetism. But the proper refutation of these theories would fill volumes. Let it suffice (and to every logician it will abundantly suffice) to remark, that this phenomenon is but a secondary fact, depending on and resulting from principles much more general, viz., the induction of magnetism, and the attraction of dissimilar and repulsion 'of similar, poles.' "

We commend the whole of this passage to the serious consideration of Dr. Faraday and all his disciples: especially the words we have put in italics. The "curious arrangement of iron filings," or, in other words, the "magnetic curves" or "lines of force," is not a "primary fact," and ought not therefore to be taken (as it is by Faraday and his followers), as "the foundation for a theory."

This article of Robison's was written in the last century; and it is therefore the more inexcusable for men of the present day to go on blundering with speculations and whimsical hypotheses, which have been so completely exploded. It is quite lamentable to find such an excellent experimenter, for instance, as Mr. Sturgeon, writing in the following strain, in the year 1833:

"I believe it is generally admitted by writers on magnetism, that a steel bar in a state of polarization is surrounded on every side by the magnetic matter, frequently called the *magnetic effluvium*, which forms to the bar a species of magnetic atmosphere. This point being granted, it will be a matter of no consequence to the present undertaking, whether this effluvial matter be stationary as regards the magnet, or whether, as some have imagined, it be continually flowing from pole to pole; it will be sufficient for the present purpose to consider it as consisting of exceedingly minute, polarized particles emanating immediately from the surface of the steel; concessions of no novel character, and such, I imagine, as but few will be found willing to deny."—(Sturgeon on the Theory of Magnetic Electricity, *Phil. Mag.* for 1833.)

And then he goes on to write about these "magnetic polar lines," in a way which would only be tolerable in a writer of the time and school of Des Cartes. But so long as our experimenters in electricity and magnetism remain so deficient in that preliminary mathematical training which alone can fit the mind for rational investigation, so long will they continue to cherish the erroneous and absurd notions which were prevalent in former ages. If Faraday had ever gone through even the most elementary course of mathematical discipline, he would have been preserved from those false and irrational notions of "force" which pervade all his writings, and damage the value even of his experimental labours. He would just as soon think of taking one "line" to represent "dinner," another "line" to represent "supper," and a third "line," intermediate to the others, to represent "tea" (*because* tea is intermediate between dinner and supper) as he would have written what he has written about "lines of force." There is just as much sound reasoning in the illustration we have given, as in his use of these "lines of force." We have already referred to the strange way in which Faraday talks about "space;" arguing about it and about its properties as if "space" were a material substance, like wood or iron. The reader may possibly fancy that we have done injustice to the author, by extracting isolated passages, which are capable of different interpretation. He may very probably think that Faraday has merely written in rather a loose and figurative way about "space," without intending to convey such absurd notions as we have supposed. He may think it impossible for such a philosopher as Faraday to hold such extravagant and senseless views. If so, perhaps the following extracts from an article of Faraday's (in the second volume of these "Experimental Researches") on Electric Conduction and the Nature of Matter, may serve to convince him that we have neither misrepresented nor exaggerated these views:

"The view of the atomic constitution of matter which, I think, is most prevalent, is that which considers the atom as a something material, having a certain volume, upon which those powers were impressed at the creation, which have given it, from that time to the present, the capability of constituting, when many atoms are congregated together into groups, the different substances, whose effects and properties we ob-

serve. These, though grouped and held together by their powers, do not touch each other, but have intervening space, otherwise pressure or cold could not make a body contract into a smaller bulk, nor heat or tension make it larger. In liquids these atoms or particles are free to move about one another, and in vapours or gases they are alone present, but removed very much further apart, though still related to each other by their powers."

* * * *

"If the view of the constitution of matter already referred to, be assumed to be correct, and I may be allowed to speak of the particles of matter and of the space between them (in water or in the vapour of water, for instance) as two different things, then space must be taken as the only continuous part, for the particles are considered as separated by space from each other. Space will permeate all masses of matter in every direction like a net, except that in place of meshes it will form cells, isolating each atom from its neighbours, and itself only being continuous. Then take the case of a piece of shell-lac, a non-conductor, and it would appear at once from such a view of its atomic constitution, that space is an insulator, for if it were a conductor the shell-lac could not insulate, whatever might be the relation as to conducting power of its material atoms; the space would be like a fine metallic web penetrating it in every direction, just as we may imagine of a heap of silicious sand having all its pores filled with water; or as we may consider of a stick of black wax, which, though it contains an infinity of particles of conducting charcoal diffused through every part of it, cannot conduct because a non-conducting body (a resin) intervenes and separates them one from another, like the supposed space in the lac. Next take the case of a metal, platinum or potassium, constituted according to the atomic theory, in the same manner. The metal is a conductor; but how can this be, except space be a conductor? for it is the only continuous part of the metal, and the atoms not only do not touch (by the theory) but, as we shall see presently, must be assumed to be a considerable way apart. Space, therefore, must be a conductor, or else the metals could not conduct, but would be in the situation of the black sealing wax referred to a little while ago.

"But if space be a conductor, how then can shell-lac, sulphur, &c., insulate? for space permeates them in every direction. Or if space be an insulator, how can a metal or other similar body conduct?

"It would seem, therefore, that in accepting the ordinary atomic theory, space may be proved to be a non-conductor in non-conducting bodies, and a conductor in conducting bodies; but the reasoning ends in this, a subversion of that theory altogether; for if space be an insulator it cannot exist in conducting bodies, and if it be a conductor it cannot exist in insulating bodies. Any ground of reasoning which tends to such conclusions as these must in itself be false." (pages 284—287.)

Oh, most lame and impotent conclusion! Did ever any man "reason" in this way before, except in the way of a joke? Did ever any rational being—even a German metaphysician, or a follower of Thomas Aquinas—argue in this extraordinary way about *physical* truths? We question it. The only "argument" that we can remember at all approaching to it, in profundity and conclusiveness, was the celebrated case of the donkey placed exactly half way between two bundles of hay, from which it was argued that he would never go to either of them to eat, *because* there was no "sufficient reason" why he should go to one rather than the other. The donkey soon solved the problem, however, in his own practical and unmetaphysical way; and we think that the equally intricate puzzle which Professor Faraday has propounded might be left to the same sagacious authority for solution.

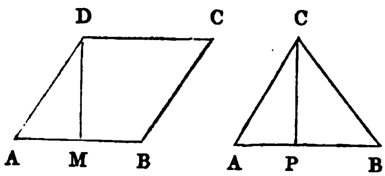
But if we must be serious, and treat this metaphysical puzzle as a practical question, it is abundantly sufficient to say that "*space*" is neither a conductor nor a non-conductor, nor *anything* else. Space has no *material* existence, and to attribute material qualities and properties to it is utterly ridiculous—sheer downright nonsense. It would be just as reasonable to argue about the attributes of "nothing." When we say a body (as a metal) is a "conductor," we simply mean to express a certain fact—a certain result of certain processes. *How* those processes are carried on—whether one particle in motion puts the adjacent particle into motion more easily in a conductor than in a non-conductor—or whatever may be the mode of working, there is no difficulty caused by the "atomic theory" any more than by any other theory. The *ultimate* fact in such processes must always be a "mystery"—an *inexplicable* fact, for the simple reason that we cannot refer it to any *other* and simpler fact.

(To be continued.)

NOTE ON TONNAGE ADMEASUREMENT.

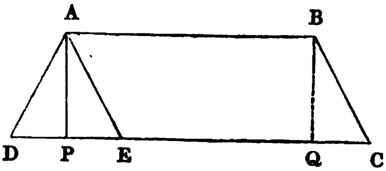
As the mode of tonnage admeasurement established by law must possess great interest for practical men, and its simplicity has been impugned, we think it advisable, even at the risk of making ourselves tedious, to undertake to make its rationale readily intelligible to any one who is acquainted with the common expressions for the areas of a parallelogram and a triangle, in terms of one of the sides, and the perpendicular let fall upon it from an opposite angle.

Thus all we require is, that the reader should know that



Area of parallelogram ABCD = AB × DM, and area of triangle ABC = AB × CP.

Next, take the trapezium ABCD with parallel sides AB, CD. Draw AE parallel to BC, and AP perpendicular on DE, and BQ parallel, (and therefore equal) to AP.



Then, area of trapezium ABCB

$= $ Area of parallelogram AECD

$+$ Area of triangle AED,

$= AB \times BQ + \frac{1}{2} DE \times AP.$

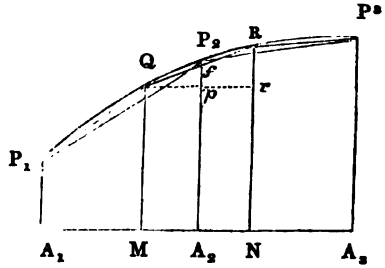
$= (AB + \frac{1}{2} DE) AP.$

$= \{AB + \frac{1}{2}(CD - AB)\} \cdot AP$

$= \frac{1}{2}(AB + CD).AP.$

or, *the area of a trapezium—i.e. any foursided figure with two parallel sides—is equal to one-half of the products of the sum of the parallel sides and the perpendicular distance between them.*

Let $A_1\ A_2\ A_3\ P_3\ P_2\ P_1$ be a portion of an area which we wish to find approximately; $A_1\ A_2 = A_2\ A_3 = m$; and $A_1\ P_1$,



$A_2\ P_2$, $A_3\ P_3$, be lines drawn to the curvilinear boundary from A_1, A_2, and A_3, at right angles to $A_1\ A_3$, and let these lines be called a_1, a_2, a_3, respectively.

Then area of the trapezium $A_1\ A_2\ P_2\ P_1$

$= \frac{1}{2}(A_1\ P_1 + A_2\ P_2)\ A_1\ A_2$

$= \frac{1}{2}\ \overline{a_1 + a_2}.m.$

And area of trapezium $A_2\ A_3\ P_3\ P_2$

$= \frac{1}{2}\ \overline{a_2 + a_3}.m.$

Therefore the whole area, excluding the small portions between the chords $P_1\ P_2$, $P_2\ P_3$ and the curve,

$= \frac{1}{2} \cdot \overline{a_1 + 2a_2 + a_3}.m.$

We may find a much nearer approximation by dividing $A_1\ A_3$ into three equal parts A_1 M, MN, NA_3, each of which is therefore $= \frac{2\ m.}{3}$ Then,

$$\text{area of } A_1MQP_1 = \tfrac{1}{2}\overline{A_1P_1 + MQ} \cdot AM$$

$$\text{,,} \quad MNRQ = \tfrac{1}{2}\overline{MQ + NR} \cdot MN$$

$$\text{,,} \quad NA_3P_3R = \tfrac{1}{2}\overline{NR + A_3P_3}.A_3N$$

Therefore the approximate area of the figure, neglecting only the very small portions between the chords $P_1\ Q_1$, Q R, and RP_3, and the curve, is equal to

$\frac{1}{2}(A_1P_1 + 2MQ + 2NR + A_3P_3)AM.$

Since $HM = MN = NA_3 = \frac{2m}{3}$

Now if f be the point in which the chord QR cuts $A_1\ P_2$

Draw $Q\,p\,r$ parallel to $A_1\ A_3$; then evidently $Qp = MA_2 = A_1A_2 - A_1\ M$

$$= m - \frac{2m}{3} = \frac{m}{3} = A_2\ N = pr$$

And by similar triangles $R\,Q\,r$, $f\,Q\,p$,

$$R\,r : fp :: Q\,r : Q\,p :: 2 : 1.$$

$$\therefore R\,r = 2\,f\,p.$$

That is, $RN - QM = 2(f\,A_2 - QM)$

$$\therefore RN + QM = 2 \cdot f\,A_2$$

and the approximate area

$$= (A_1\ P_1 + 4\,f\ A_2 + A_3P_3)\,\frac{m}{3}\ .$$

Now, this area is evidently too small; if then we take $f A_2 = A_2 P_2$ we shall still more nearly approximate to the correct value.

Therefore area $A_1 A_2 P_2 P_1$ very approximately

$$= (A_1 P_1 + 4 A_2 P_2 + A_3 P_3) \frac{m}{3}$$

$$= (a_1 + 4 a_2 + a_3) \frac{m}{3}.$$

A similar expression would apply to the approximate area contained between any other 3 *ordinates* a_3, a_4, a_5, for instance, which would

$$= (a_3 + 4 a_4 + a_5) \frac{m}{3}.$$

If then the whole area is divided into an equal number of spaces, by an odd number of lines drawn like $A_1 P_1$, or ordinates at equal intervals $= m$, and we suppose the whole number to be $\overline{2n+1}$, we shall have approximate area of

$$\text{1st two portions} = \overline{a_1 + 4 a_2 + a_3}\, \frac{m}{3}.$$

$$\text{2nd} \ldots\ldots\ldots = \overline{a_3 + 4 a_4 + a_5}\, \frac{m}{3}.$$

$$\text{3rd} \ldots\ldots\ldots = \overline{a_5 + 4 a_6 + a_7}\, \frac{m}{3}.$$

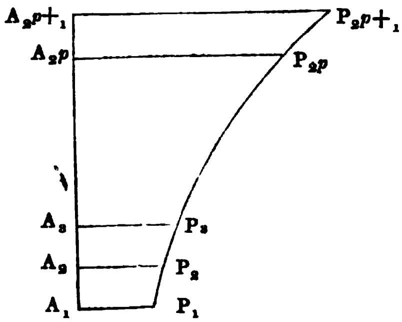
$$\text{Last} \ldots = \left(a_{2n-1} + 4 a_{2n} + a_{n+1}\right) \frac{m}{3}.$$

$$\text{Whole area} = \left\{a_1 + a_{n+1} + 4(a_2 + a_4 + a_6 + \&\text{c.}\, a_{2n}) + 2(a_3 + a_5 + \&\text{c.} + a_{2n-1})\right\} \frac{m}{3}.$$

Now, if we have an odd number of such areas at equal intervals n, it is evident that we shall get the solid contents of the figure of which these areas are parallel sections by treating them as ordinates to a curve, and if $A_1, A_2, A_3 \ldots\ldots A_{2p+1}$ be the odd number of areas separated by the common interval p, and S the approximate solid contents,

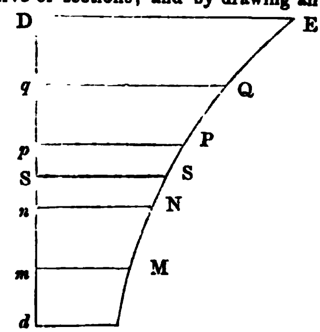
$$S = \left\{A_1 + A_{2p+1} + 4(A_2 + A_4 + A_6 + \&\text{c.} + A_{2p}) + 2(A_3 + A_5 + \&\text{c.} + A_{2p-1})\right\} \frac{n}{3}.$$

Suppose, in performing this last process, we take a line $A_1\ A_{2p+1}$, and set off



along it equal intervals $A_1\ A_2, A_2\ A_3, \ldots A_p\ A_{2p+1}$ which represent n; and to the same scale set off at A_1, A_2, &c., straight lines perpendicular to $A_1\ A_{2p+1}$, and *proportional* to the areas $A_1, A_2, A_3, \ldots\ A_{2p+1}$ in magnitude; viz., $A_1\ P_1$, $A_2\ P_2 \ldots$, and through $P_1, P_2, P_3, \ldots, P_{2p+1}$ draw a curve; it is evident that S just obtained equals the area of the curve $A_1\ P_1\ P_2 \ldots P_{2p+1}\ A_{2p+1}$.

Take a line Dd, to represent the depth of a ship; let dD be divided into any number of portions, dm, nm, np, Pq, &c.; and suppose the cubical contents for the heights dm, dn, dp, &c., to be calculated and set off at right angles to dD, at points m, n, &c., mM, nN, nP, qQ, and DE, and draw a curve through these points. This is what is meant by the curve of sections; and by drawing an ordi-



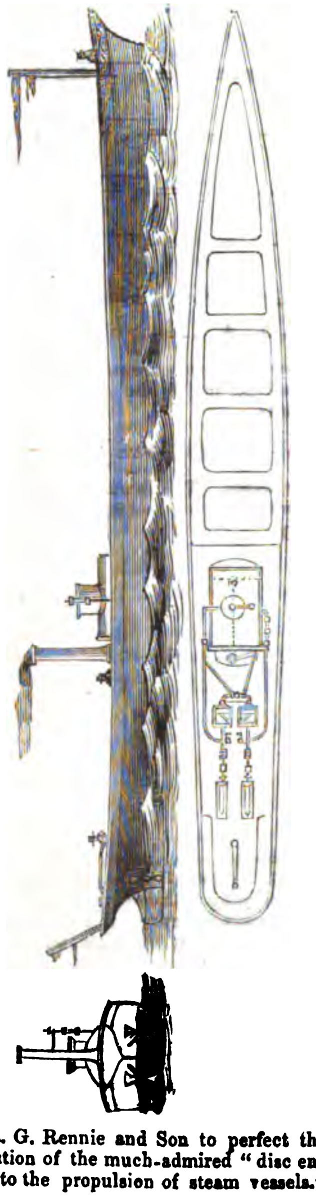
nate through any other point of dD as through S; then S S is the displacement corresponding to the depth, dS.

In forming a curve of sections it would not be advisable to calculate separately the displacement for each depth: but it would be easy to calculate each succeeding displacement from the preceding. It is not, however, our object to show how to do this; but to explain this wonderful mystery of the "*problem for the* reduction of parallelopipedons by *rectangular* coordinates;" and we believe that we have fully redeemed our pledge.

When the matter is dispassionately considered, the wonder is that a rule for the calculation of the cubical contents of an irregular solid is capable of so simple and satisfactory an explanation.

SCREW STEAMERS FOR THE RIVERS OF INDIA.

In our last volume we gave an elaborate account of the successful efforts made by



Messrs. G. Rennie and Son to perfect the application of the much-admired "disc engine" to the propulsion of steam vessels.* Since the time at which that account was written, a second screw steamer, designed for the purpose of running on the rivers of India (where a small draught of water is indispensable), has been constructed and fitted by that firm. The accompanying engravings represent this steamer, the excellent qualities of which may be seen in the following statement of its dimensions, capabilities, &c.

The length of the boat is 70 feet; its breadth 7 feet 6 inches; its depth 3 feet 6 inches; its draught of water 2 feet. It is fitted with two similar screws, 2 feet 2 inch in diameter, and of a pitch of 4 feet. The engines and screws make 260 revolutions per minute, and produce a speed of 10 knots per hour in the boat. The weight of the vessel is three tons, 8 cwt., and that of the machinery three tons. The power of traction is 250 tons. Finally, the consumption of coal is but 100 lbs. per hour, and the cost of trackage no more than 1*s.* 3*d.* per mile.

We think it is not too much to say, that the applicability of the disc engine to screw propulsion is now fully established, and that it is proved to be highly effective and economical. Its general advantages are well known.

* See vol. lxiii., p. 266, No. 1676.

A PLAN FOR SECURING THE BEAMS OF SHIPS.

BY THE LATE LIEUTENANT WILLIAM G. J. CUNNINGHAM, ROYAL NAVY.

The following consists in dovetailing each beam into the shelf-piece, the waterway, and the spirketting, the first plank of which, together with that of the deck, form, as it were, keys to the system of dovetailed parts making the end of the beam solid with the shelf-piece and waterway. The strength which would thus be given to the frame of the ship would be very great.

Fig. 1 is a transverse view of a portion of a ship's side. Fig. 2 is a representation of the under-side of the waterway, showing the manner in which it dovetails into the beam.

Fig. 2.

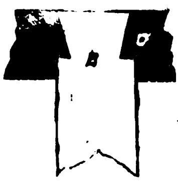


Fig. 3.

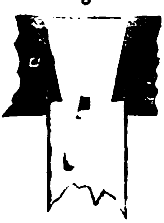
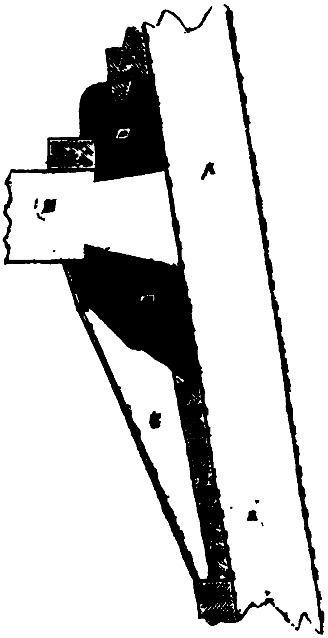


Fig. 3 is a representation of the upper side of the shelf-piece, shewing the manner in which

the beam dovetails into it. A is the frame timber of the ship; B is a portion of the beam; C is a portion of the waterway; D is the shelf-piece; E, the chock which receives the iron knee which is fitted beneath the beam; F is the first piece of spirketting; G is the first piece of deck (or thin waterway); and H H, are the inside planking. With the

Fig. 1.



aid of the engravings and the preceding references, the nature of the combination will be readily understood. The fastenings do not differ materially from those at present employed in Her Majesty's ships.

WOODCOCK AND GARDNER'S PATENT FURNACES.

To the Editor of the Mechanics' Magazine.

Sir,—Mr. Woodcock's letter demands a reply, filled as it is with misstatements and unjust reflections. I am truly surprised, when I consider the total distinction and difference which exists between my patent apparatus and that of Mr. Woodcock's, that this gentleman should so far consider himself aggrieved as to attack me in the unwarrantable manner he has done. The object of each patent is undoubtedly the same, but the means to the end are very different. All patents for improvements in burning fuel possessing any pretensions to science aim at the proper provision of air, and the proper admixture of the products of combustion therewith. Invention, as regards principle, is out of the question; the principle involved must necessarily be the same. The principle must exist previous to the invention; ergo, the principle cannot be new. We will, in the first place, inquire of what Mr. Woodcock's invention consists, according to his specification. 1st. Of a furnace door, which door is pierced with holes to admit air to the interior of the furnace; but Mr. Woodcock states he is aware that such an arrangement *is not new*, and that he lays *no claim* to this *separately*. 2nd. Of a hollow bridge in place of the ordinary one. This bridge is supplied with air by means of a flue or flues for conveying air through the furnace or brickwork thereof. But Mr. Woodcock again informs us that he is aware that such a bridge and such flues of supply "*are not new*," and that he makes no claim to these "*separately*." 3rd. Of a hanging bridge, situated somewhat nearer the front of the furnace than the last, and of a similar character; but Mr. Woodcock confesses that he is aware that such a hanging hollow bridge so situated "*is not new*," and he makes no claim to this "*separately*." 4th. Of an iron plate provided to each bridge, and perforated to divide the stream of air, which again Mr. Woodcock acknowledges "*is not new*," and again disclaims this "*separately*." Can we feel surprised that one who confessedly "makes up" an arrangement, and without hesitation despoils preceding inventors of their claims by absorbing and "dishing up" just those parts which suited him, styling it invention, should be found equally willing to absorb as many more as he may think desirable?

It is scarcely necessary to describe my apparatus, so constantly to be seen in your own and other journals; suffice it, I have no hollow bridge supplied with air or otherwise; I have no hanging bridge supplied with air or without that supply, such as Mr. W. I use a new and distinctive arrangement, whereby I am enabled to effectually heat the smoke and gaseous products before allowing the air to come in contact with them. I also carefully preserve the fuel in my furnace from the exterior cooling atmospheric air. Mr. W. chooses to make additions to my specified words, when to "certain arrangements of diaphragms," he adds, "simply bridges." They are not bridges, do not fulfil the office of a bridge, being beneath, and in front of the ordinary bridge, which latter still remains unaltered. I do most certainly in my patent preserve to myself the exclusive right, &c., &c.; but certainly do not make any claim to Mr. W.'s plan, which is anything but simi-

lar in action, likeness, or effect to mine. It is somewhat surprising that the "few *colourable alterations*," which Mr. W. would make us believe quite sufficient to destroy anything like useful effect, should create in him so much uneasiness. We apprehend it arises more from the knowledge he has gained, as we have done, of the complete success and superiority of my invention from past and present use. It is needless to notice the remaining remarks of Mr. W., for which he certainly has no warrant, than by observing, that he who is capable of clandestinely endeavouring to injure his fellow man must meet only with the just contempt he deserves. It is evident, upon inspection, that the two patents are widely separated in mechanical, as well as theoretical details. Did I not wish to curtail this communication, I might point out wide and distinctive features existing between them. I would not, nor do I claim the exclusive right of using Mr. W. Woodcock's patent, nor do I wish in any way to claim any part or portion thereof, whether, as Mr. Woodcock says, "exclusively" or otherwise. I would claim for myself that justness and honesty of purpose which would free me from wittingly trespassing upon my fellow's rights, much more from persevering in such a course. That Mr. W. is mistaken I feel assured, and propose that he place side by side with mine in your Magazine a cut of his apparatus; and that all may judge of the truth of the statements made by each, my advertisement containing a wood cut issues from your office each alternate week, showing the precise apparatus used by me; to this I would refer all who wish to understand the matter.

I am, Sir, yours, &c.,
EDWARD GARDNER.

To the Editor of the Mechanics' Magazine.

SIR,—In your number of this day, I find Mr. Woodcock again referring to his paper read before the Institution of Civil Engineers, respecting his own patent furnace, and affecting to be indignant at Mr. Gardner claiming the merit which belongs to him. Mr. Woodcock appears to have forgotten that I have already, through the *Mechanics' Magazine*, pointed out that whatever merit his plan is entitled to, is exclusively owing to his direct imitation of the principle and mode of introducing the air to the furnace, as described in the specification to my now expired patent of 1839.

In your this day's number, Mr. Woodcock describes his own patent as "a hanging bridge so arranged as to cause the products of combustion" [he should with more correctness have said, the products of *non*-combustion], "to be directed downwards, below the hanging bridge," and that these products "will be supplied with *numerous jets of air*." Again, that in the paper abovementioned, he has stated, as the chief value of his invention, that the peculiar position of the inverted bridge "*compels the flame and gases to impinge on the incandescent coke* lying on the bars, whilst, as they leave the fuel in distillation, they are entirely surrounded by small jets of atmospheric air." I would here only observe that this reference to the air being supplied *by jets*, is an accurate description of my expired patent, and which comprises the sole merit of the plan. Many illustrations of this will be given in the essay for which the Society of Arts have just awarded their prize, and which will shortly be published in a single tract.

Mr. Woodcock then gives a description of Mr. Gardner's patent, viz. "The said invention consists in certain arrangements of diaphragms (simply, bridges), so disposed as to cause the products given off to pass through, or in contact with the heated material on the grate, and to cause the so-heated products to be brought into contact with sufficient supplies of air to produce combination therewith, and render their combustion perfect."

Mr. Woodcock then asserts that "both patents are substantially the same to all intents and purposes." In this, Sir, I believe the public will entirely concur. I am unable to perceive any difference. I must, however, add that, as far as the causing the flame and heated products to pass through, or in contact with the heated material on the fire grate, they are both a mere imitation of the patent of Watts, in 1785, and are both radically and chemically *wrong*. As to the really useful part of both, the introducing the air by numerous jets, they are both essentially *right*, though neither can now have any claim to merit, originality, invention, or patent right.

I would here ask either gentleman, for what purpose would they bring "the flame and gases to impinge on the heated coke on the bars?" seeing that the carbon which then alone requires combustion and is alone the element of the colouring matter in smoke, is already, and every atom of it, at the moment, at the high temperature of 3000° or incandescence. The attempt to heat the carbon, *then at* 3000°, is not more rational than to endeavour to heat the sun's rays, by means of red hot coke. I am, &c.,

C. W. WILLIAMS.

Liverpool, April 19, 1856.

To the Editor of the Mechanics' Magazine.

SIR,—It may save Mr. W. Woodcock and Mr. Gardner much angry and useless discussion, to refer them to Newton's London Journal, conjoined series, vol. xiv.,

page 392, giving the specification of Richard Rodda. The invention is stated in West's account of patents for smoke preventing or consuming, 1842, to consist—"in drawing the smoke [gas] through the fire, and through passages composed of fire brick, strongly heated. The smoke [gas] is previously mixed with a due proportion of atmospheric air, admitted through a box or valve over or near the fire door, which valve is opened or shut as the gases may require."

I believe it is still in use at Messrs. Barclay's Brewery, and a main feature in it is a bridge or arch against the boiler bottom half-way over the fire grate; in short, at page 370 of your last number, Mr. Woodcock, in quoting his own specification, admirably describes Rodda's expired patent invention of 1838. Where is this resurrection of obsolete inventions to end?

I am, Sir, yours, &c., J. S. S.

High-street, Woolwich,
April 19, 1856.

MECHANICAL LOCOMOTION.

To the Editor of the Mechanics' Magazine.

Sir,—I am induced by the lucid manner in which "W." has pointed out the proper method of treating the subject in discussion, in one paragraph of his last letter, to make a remark or two in order to endeavour to aid in applying that method to the matter in hand. He says that we ought "to confine ourselves to the ideas of those forces which are employed to produce motion, and those forces which nature opposes to motion," which is precisely what I contend for. Now, "W." will admit that a force of 100 lbs. unbalanced in the machine pressing against the end of the cylinder would impel the engine forward, overcoming the resistances to motion, and continuing it until something greater than the mere friction of the engine interfered. Next, let this pressure be produced by steam acting in a cylinder, and now suppose that a piston is *fixed* in the middle of the cylinder, a "force which nature opposes to motion" immediately appears, and entirely and exactly neutralises the first; this is when the action and reaction of the steam are both in the machine, and under the same condition, that is, simply pressing on parts of a rigid framework. Let us now make the pressure on the piston to reach the framework or mass of the engine in a different manner, leaving the pressure on the cylinder end perfectly unaltered; let the piston press against the middle of the spoke under the axle of the wheel in a direction contrary to the pressure on the end of the cylinder, and reckon what must be its force when its pressure reaches the axle, by this means omitting friction and obliquity; whether its fulcrum is at the foot or the centre it would be plainly, just 500 lbs., and on the rule which "W." lays down, from these materials, it would at once appear that the undiminished force on the end of the cylinder would propel the engine with a power of 500 lbs., unless there could be shown to be other impelling or retarding forces at work. In the case put first no one would admit that there were such additional forces; *yet the pressure on the cylinder end impelled the engine*, and the driving wheel revolved, and the "friction" and "adhesion" existed without being at all propulsive or *doing any* "*work*." In the second case, it is perfectly clear that no motion took place, because the action and reaction were both in simple operation in the machine; and in the third case, it appears to me to be also clear, that motion did result from the action of the steam on the face of the piston being made to reach the mass of the engine through a lever which diminished its effective pressure against it, and so enabled the unaltered reactive pressure on the end of the cylinder to overcome that on the piston, and thus produce motion forward. I have thus endeavoured to apply "W.'s" method of reckoning the pros and cons of the forces at work as strictly as possible, and, I think, correctly. By laying down that rule, he has made it plain, that *if he would give full consideration to the reaction of the force employed*, he would be likely to agree with my views, and has narrowed the question between myself and him to these points: Does he deny that the law of "action and reaction," operates in locomotive machines? Can he explain away, in the third case, the force which was proved to be fully propulsive in the first? Can he give good reason for believing that there are fresh forces at work in the third case, which are able to *neutralise the reaction*, and propel the engine themselves? I believe that "W." would find no difficulty in adopting my explanation if his mind were not already occupied with preconceived ideas, and I commend to his consideration the boat illustration in my last letter, as being conducted exactly in accordance with the method which he has since advised, and tending greatly to suggest clear ideas as to the real cause of the motion of locomotive machines. Actually to try the experiment is the best way to perceive its meaning, and to present most vividly to the mind the parallel case of a locomotive. I cannot admit that the motive force is applied "to produce motion round the axle;" that kind of motion takes place as well in the other wheels, but is not accounted propulsive in them; and when the power actually expends itself in producing "motion round the axle," *i. e.*, in "slipping," it is notoriously lost labour. Has "W." ever

seriously set to work and actually calculated how a force revolving in the rim of the wheel could propel the engine? A force at the foot of the wheel *would not propel at all;* experiment proves this. He says, that the desired rotation "of the wheel is opposed by the friction of the rail." Has he considered the fact, that it is when this friction is *not* overcome, that motion takes place, while, according to his doctrine, motion should result from the "moving force" being superior to the resistances, of which he says this friction is one? I simply look upon the friction as resistance furnishing a fulcrum or abutment for the lever which the piston actuates.

As all machines consist of a series of levers and fulcrums, I am obliged utterly to dissent from "W.'s" advice to refrain from considering what levers and fulcrums they are composed of; I consider, that though the philosopher may content himself with the general consideration, that the work done is of course equivalent to the original expenditure of power, minus friction and imperfections in the application, it is the business of the mechanician to trace the power *all through* its course, show exactly how it does its work, and what is its force and pressure at any point of the machine; otherwise can he be said to really "understand" the machine? I believe that a deficiency in this respect is the cause of very serious defects in the locomotive engine.

I am, Sir, yours, &c., C.

April 8, 1856.

P.S. *April 15th, 1856.*—Since the above letter was written I have read Mr. Cheverton's last letter, and cannot but be struck by the near approach to my view of the real cause of the propulsion of boats which some of his remarks exhibit. He says that the pressure on the rowlock would be "the measure of the propelling force if the oar were handled from the outside of the boat," and refers to the fact that in that case the reaction would be external to the boat. Now what is this but saying, that when the reaction is *in* the boat, as it ordinarily is, the propelling power consists of the pressure on the rowlock, *minus the reaction* through the rower's body? No other change has taken place than causing the reaction to operate *in* the boat; and it appears to me to be clear that the pressure upon the rowlock cannot possibly exceed that of the reaction, except by the leverage of the second order of the oar causing it to press against the rowlock with augmented force. Mr. Cheverton has shown that when the oar has no leverage against the rowlock, from the hand of the rower being slid down to it, no propulsion takes place; but does not that decisively prove that as when in that case, and in the case of the man tugging at a rope, no motion resulted because the reaction balanced the action, so when motion did result, it arose solely from one of these powers having a leverage over the other? The only leverage which the oar could have upon the rowlock is evidently that of the second order, and its fulcrum must equally plainly be the resistance of the water.

I think that "W." and Mr. Cheverton would derive more profit from their reflections on these subjects, if, instead of occupying their minds so much upon points relating to the equality between the power employed and the amount of resistances overcome, or "work done," and upon the interchangeability and inversions of levers (points neither novel or disputed), or upon the speciality of the aspect of things when viewed with a "practical" or a "theoretical" eye, they would bring forward more arguments to prove the positions which are contended for. As far as I can see, that matter has not been well attended to, the disproving of each other taking up too much time; while it is frequently possible, (and I think is in their case) to effect that without proving ourselves or anything else to be right. Many of "W."'s positions, and also Mr. Cheverton's, may be admitted without our being the wiser, or nearer to the mark, especially some about the equilibrium of the power, &c., and the inversion of levers. That which I, and probably the bulk of your readers desire, is, that each should show, in clear and simple language, plainly and specifically how the motive force moves the locomotive or boat, beginning at the point where the power is first impressed, showing the stages through which it passes, and at last tracing it up into the engine and train, or boat, in the shape of an adequate propulsive force actually operating upon the thing to be propelled. This I think a reasonable requirement, and I should consider its satisfaction indispensable on the part of any one who professes to understand the matter.

I doubt not that Mr. Cheverton will always be able to deal heavy blows upon "W." until the latter gentleman takes proper account of the reaction of the force employed. No learning or skill can supply such a defect as that. Still it will not follow that Mr. Cheverton himself is right; and I hold it to be of much more importance to search for and prove the truth of our own opinions than to disprove those of individuals. To prove the existence of a well-known general relation between the amount of the power and that of the work, or the compatibility of certain calculations respecting the well-understood relations of levers to each other, and to their fulcrums and forces, with "W.," or to detect the errors that may be committed in so doing, with Mr. Cheverton, may leave us still without a clear idea of

how a boat or an engine is propelled, or whether the oar is a lever of the second order or not, while these are, I believe, the points which it is profitable to discuss, and which have excited the interest of your readers.—

C.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

GRENET, E. Jun. *An improved electro-magnetic apparatus for motive power, part of which may be employed separately for the generation of electric currents.* Patent dated September 8, 1855. (No. 2043.)

This invention consists—1. In an electro-magnetic engine consisting of two concentric cylinders placed one within the other, and having formed on them rings of iron, the outer cylinder being stationary and the inner cylinder revolving, both cylinders being provided with electro-magnets consisting of rectangular soft iron strips or plates fixed to the rings by which the cylinders are surrounded, the plates of the inner cylinder being on its outer surface, projecting radially outwards, and those of the outer cylinder being on its inner surface, projecting radially inwards; copper conducting wires being coiled round the plates for the passage of the electric fluid and the consequent development of magnetic action. 2. In an improved current changer and contact breaker which effect the simultaneous magnetization of the fixed and revolving parts of the apparatus by two different currents; also in an improved arrangement of contact-makers, and an arrangement of conductors whereby the tension of the electric fluid may be diminished, by using derived currents, and which allows of the employment of a single fluid battery. 3. In an arrangement for filling and emptying single fluid batteries. And lastly, in a new arrangement for increasing the surface subjected to the action of the battery.

PANET, J. *An improved hydraulic system for propelling on railways, or obtaining motive power and distributing water.* Patent dated September 8, 1855. (No. 2044.)

This invention consists in a method of propulsion by hydraulic power, and in the employment, for various purposes (agricultural and other) of the water used therein. The power is obtained by forcing water through a large tube, laid below a road, from which tube the water is forced or rises through short lengths of tubing or junction-pipe into a series of supplementary tubes (parallel to the large tube below the road), in each of which supplementary tubes is fitted a piston, provided on both sides with rods, which are prolonged beyond the extremities of the tubes and carry stops; these stops, coming in contact with suitably-arranged levers fixed in the framework of a carriage, propel the carriage.

HEWETT, C. *Certain improvements in baking-ovens.* Patent dated September 10, 1855. (No. 2046.)

These improvements consist in having ovens made of two metallic chambers or cases of suitable dimensions, one within the other, well screwed together or riveted so as to be perfectly tight, and in introducing in the interval between the two chambers grease or oil, so that by applying heat to the outer case the inner one may be heated by the oil or grease.

SHARPE, E. *Improvements in pans for water-closets.* Patent dated September 10, 1855. (No. 2047.)

The object of this invention is to construct such pans with channels placed upon and around, or partially around, the upper part, such channels having perforations formed therein so as to allow the water to descend over every part of the pan. One opening, slit, or aperture is made all round the under part of the said channels, immediately over the upper inside surface of the pan, and the width of such opening increased or diminished in those places where it is found desirable to increase or diminish the flow of water, or separate openings are made, being increased in size or number where required.

BULL, H. *Railway permanent way materials.* Patent dated September 11, 1855. (No. 2053.)

This invention relates—1. To certain longitudinal sleepers. 2. To a construction of rail, increasing the actual depth and surface of iron exposed to the action of the wheel, at the same time decreasing the weight thereof. 3. To the letting of the cross sleepers into the longitudinal sleepers, and connecting them with them by angle irons and an iron strap. The rail is a mere rectangular bar, screwed down to the longitudinal bearer, which is notched out at its inner and upper edge along its whole length.

LEBAIGUE, F. H. *An improvement in the manufacture of chocolate.* Patent dated September 11, 1855. (No. 2056.)

This invention consists in using cod-liver oil in preparing chocolate. The oil is mixed or ground with the chocolate, and the compound is made into form in moulds as heretofore, and may also be mixed with flavouring (or medical) and other matters.

CURTIS, M., and J. WAIN. *Improvements in machinery for preparing and spinning cotton and other fibrous substances.* Patent dated September 11, 1855. (No. 2057.)

This invention consists in the six following improvements, which apply chiefly to the self-acting mule (the 3rd being applicable

also to hand mules). 1. In placing the friction cones used for backing off on the roller shaft, or equivalent therefore, and in driving such cones by an independent band, distinct from the rim band. 2. In an apparatus for regulating the winding on motion, so arranged that the time during which motion can be communicated to the screw on the radial arm, for raising the nut on the screw by the depression of the counter faller, is gradually diminished until the formation of the bottom of the cop is completed. 3. In the application in mules (where the drums are driven by bands) of a spring to the tightening pulley of the drum band, to keep the band at a uniform tension. 4. In connecting, by means of gearing, the back or drawing out shaft, with the shaft on which is placed the pinion which gives motion to the quadrant of the radial arm. 5. In passing the scroll band round or over a pulley fast on the drawing out or back shaft, to assist in turning that shaft when the carriage is going in. 6. In an arrangement for putting the friction cones in and out of contact.

KENNEDY, J. C. G. *Improvements in the mode of and apparatus for transmitting signals by the use of the electric current, part of which improvements is applicable to the regulating of machinery generally.* (A communication.) Patent dated September 11, 1855. (No. 2058.)

In this invention clockwork is employed for driving certain mechanism, which is rendered intermittent by a permanent magnet.

BOUCHARD, E. C. Z. *Certain improvements in producing gas for lighting and heating.* Patent dated September 11, 1855. (No. 2059.)

The inventor describes apparatus for generating gas from coal, and for employing the waste heat from the fuel used in the distillation thereof to generate steam and hydro-carburetted gas; also, an arrangement for mixing one or both of these with coal gas at the time of its production.

HIGGIN, J. *Improvements in treating madder, or preparations of madder, so as to obtain a colouring substance therefrom.* Patent dated September 12, 1855. (No. 2060.)

These improvements consist in subjecting madder, munjeet, &c. (with the exception of garancine (and garanceaux) to the action of ammonia in the state of gas, either alone or mixed with steam.

MACINTOSH, J. *Improvements in springs.* Patent dated September 12, 1855. (No. 2061.)

In this invention membraneous tissue or skins are prepared in glycerine, or in glycerine or gelatine mixed with water, so as to render them pliable and impervious to air or air-tight, and are then formed into a bag and put into a cylinder. A plunger is then inserted into the cylinder, and made to act upon the bag, thus forming an elastic air spring.

SPILSBURY, F. G., and F. W. EMERSON. *Improvements in the manufacture of paints and pigments.* Patent dated September 12, 1855. (No. 2063.)

Claims.—1. The use of the tungstates of oxides of zinc calcium, antimony, aluminium, magnesium, barium and strontium as paints or pigments. 2. Any combination or mixture of two or more of the aforesaid tungstates. 3. All mixtures or combinations of the above-mentioned tungstates with oxide of lead, in whatever manner produced. 4. All mixtures of the aforesaid tungstates, whether with or without oxide of lead, with the antimonites, antimoniates, arsenites or arseniates of any of the aforesaid bases, when applied to the manufacture of paints or pigments.

PROGER, J. G. *Improvements in ships' signal lanterns.* Patent dated September 12, 1855. (No. 2064.)

The two sides of the improved lantern are inclined to each other, the back and front being parallel. In the front, and on each side, is fixed a lens. The three lenses are on the same level, and show the light of one lamp through them. On the outside of the lantern there is a concave reflector around each of the lenses. Each of the side lenses is arranged to have a frame glazed with green or red glass slided between it and the burner. The lamp or burner has a tubular projection at its under side, which fits on to a similar fixed projection at the bottom of the lantern.

BARBER, B., J. BUTTERFIELD, and T. AUSTIN. *Improvements in mangles.* Patent dated September 13, 1855. (No. 2065.)

This invention consists in peculiar arrangements of mangling rollers. In one arrangement two driving rollers are placed horizontally in a suitable frame, side by side, about an inch apart, and one cloth roller is placed centrally above and touching each of the lower rollers, &c.

MACINTOSH, J. *Improvements in metallic and other pens.* Patent dated September 13, 1855. (No. 2066.)

These improvements consist—1. In forming on one piece of steel or other material, suitable for the manufacture of pens, a nib at each end. 2. In making pens of a flat instead of a semi-cylindrical shape, as is usually the case.

DE LUCENAY, P. B. *Certain improvements in the batteries of guns and pistols.* Patent dated September 13, 1855. (No. 2067.)

In this invention the cock or hammer is

composed of steel, and works on a pin; a slot in the upper part forms a sight for taking aim. The hammer is provided with detents, and the steel spring is pressed upon when the cock is drawn back. The trigger, by means of a spring, then catches in the other detents, to keep the hammer at full or half cock. The first-mentioned spring and hammer are placed in a groove made in the upper part of the stock, the spring being fixed by means of a screw.

TUCK, J. H. *Improvements in apparatus for carrying on submarine operations.* Patent dated September 13, 1855. (No. 2070.)

The diving bell is constructed so as to afford means of readily compensating for the variation of the relative density of the air in the working chamber of the bell and the water underneath it, occasioned by the variation in the depth of the column of water above it. This is accomplished first by means of a drop-weight at the bottom of the bell, combined with an escape-valve of suitable construction at the top of the same, both being acted upon as required by the diver from within; secondly, by means of a series of channels formed within, or near the bottom of the bell, through which channels the surplus air is allowed to pass out of the bell as soon as the air in the working chamber has by its expansion expelled the water.

LONGBOTTOM, A. *Improvements in the manufacture of gas when oils or fatty matters are used.* Patent dated September 13, 1855. (No. 2071.)

The inventor constructs each retort with a projection at the bottom, convex inwards and concave on the outside, the retort being of the form of a truncated cone, the bottom at the smaller end, where it is heated by a fire. The oil or fatty matter is supplied through a tube (which descends through the inner perforated false bottom of the retort,) and falling on the convex projection is vaporized, the vapour passing through the perforated false bottom, amongst the heated mixture of charcoal and lime, and then out of the retort for use.

HARTMANN, J. A. *Certain improvements in the preparation and combination of colours for printing stuffs and textile fabrics.* Patent dated September 14, 1855. (No. 2072.)

This invention relates to the production of various steam colours from precipitated deoxidised indigo, and also from extracts of madder, and prussiates of potash, or other prussiates. The precipitated deoxidised indigo may be prepared by any known process.

GARBAI, J. P. *An improved powder or composition for cleaning and preserving the teeth.* Patent dated September 14, 1855. (No. 2073.)

This improved composition is composed of sea salt mixed with iron in solution, coffee and chicory, sugar, rice-flour, and saffron, to which rhubarb may be added; and also, when intended for daily use, cream of tartar and ivory powder.

CHURCH, W. *Improvements in mounting and adjusting ordnance and other fire-arms.* Patent dated September 14, 1855. (No. 2074.)

Claims.—1. Mounting ordnance and other guns or carriages connected with a traversing platform, so that the said carriages are guided thereon, and preserve their position, and cannot be raised from the rails. 2. Connecting gun carriages with the traversing platform upon which they work by means of straps or bands of vulcanised caoutchouc, so as to counteract the recoil of the gun, and restore it to its place after its discharge. 3. Adjusting ordnance and other guns by means of a telescopic screw connecting the breech end of the gun with the gun carriage. 4. Raising the traversing platform of gun carriages, by elevating and depressing the traversing end of the same, upon the vertical bolt or shaft carrying the cross piece to which are attached the rollers upon which the traversing motion is performed. 5. Locking the rollers of the traversing platform. 6. Mounting the barrels of such fire-arms as have a number of barrels capable of being discharged simultaneously, so that the said barrels may be made to take positions parallel to each other, or be inclined to each other at any desired angle, and also capable of motion in a vertical and horizontal plane.

GOMME, T. Jun. and C. E. A. BEAUGRAND. *Certain improvements in machinery for manufacturing copper and other metal wares.* Patent dated September 14, 1855. (No. 2075.)

This invention consists in making by mechanical means culinary vessels and others manufactured by coppersmiths and tinkers for domestic purposes, which have been generally made by manual labour and by the hammer. The proposed mode of manufacture consists of various means of working the metal.

DEWDNEY, G. *An improved manufacture of protector applicable to the chest, throat, and other parts of the body requiring protection from the cold.* Patent dated September 14, 1855. (No. 2077.)

The patentee constructs protectors of layers of silk which slide over each other when worn, thereby generating and maintaining a gentle heat at any required part of the body.

THOMAS, W. F. *Improvements in sewing-machines.* Patent dated September 14, 1855. (No. 2079.)

This invention comprises several arrange-

ments for stopping the machine when the needle thread is broken; for changing the direction of the fabric in a simple manner; for producing a kind of back-stitch; for producing a zig-zag line of work; and for making each stitch a fast stitch.

WOHLGEMUTH, P. F. *The construction of bridges.* Patent dated September 15, 1855. (No. 2081.)

The patentee proposes to construct bridges of pontoon-shaped, iron boats, about 200 feet long, 70 wide, and 40 deep, having concave sides and bottoms, and hollow iron stanchions, 30 feet apart, with iron compartments between, made to open from the top on centres, and having bulwarks 20 feet high. Two or more of these boats may be braced together with diagonal tie bars. The bottoms of the boats are to be firmly tied together by a circular, concave iron frame, keeping under water a number of hollow iron caissons or cylinders, at 50 feet from the surface. One or more piers, 100 feet high, are erected on the platform and braced together by diagonal tie-bars, forming frames on either side to support the top and sides of piers, themselves being the starting point of the arches.

MARTIEN, J. G. *Improvements in the manufacture of iron and steel.* Patent dated September 15, 1855. (No. 2082.)

This invention has for its object the purifying iron when in the liquid state from a blast furnace or from a refinery furnace, by means of atmospheric air, or of steam or vapour of water applied below, so as to rise up amongst and penetrate every part of the metal prior to the congelation, or before such liquid metal is allowed to set, or prior to its being run into a reverberatory furnace in order to its being subjected to puddling.

CHANDLER, H. *Improvements in roasting-jacks.* Patent dated September 15, 1855. (No. 2083.)

This invention comprises a method of producing alternate rotary motion in roasting-jacks, by causing teeth of unequal length on or near the opposite extremities of the same diameter of a crown wheel, alternately to engage with, and communicate motion to pallets or teeth on an axis situated in a plane parallel to that in which the crown wheel rotates, the said wheel consisting of toothed and untoothed portions alternately. Also in a method of producing an alternating rotatory motion in roasting-jacks by the use of an escapement similar to the ordinary clock escapement; and in transmitting the motion of the escapements of roasting-jacks to the vertical axis from which the matters to be roasted are suspended, by means of catgut or other flexible cord or line, the ends of which are coiled in opposite directions round the said axis.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BALESTRINI, P. A. *Improvements in insulating wires for electric telegraphs.* Application dated September 8, 1855. (No. 2039.)

This invention consists in first winding the wires with hemp or other fibres, on to which several coatings of a solution of India-rubber are applied, and a coating of marine glue added. The wire thus coated is then wound with strands or yarns (laid around side by side) of hemp or other fibre, in the opposite direction to the previous winding, and coatings of India-rubber solution and of marine glue again applied. Each wire thus coated is then placed in a cord yarn or strand, coated thoroughly with waterproof coating, and laid down for use; but when several wires are to be used, and greater strength is required, then a metallic wire is wound round the bundle of insulated wires.

ROBERTSON, A. *Improvements in the treatment, cleansing, and finishing of textile fabrics.* Application dated September 8, 1855. (No. 2041.)

This invention relates to various mechanical arrangements to be used for bleaching or chemically treating, washing, and cleansing textile fabrics, especially sewed muslins or embroidered goods. The improvements comprehend several stages of bleacher's and finisher's operations.

ALLAN, T. *Certain means of correcting or preventing the deviation of the compass needle from local attraction.* Application dated September 8, 1855. (No. 2045.)

In this invention, as a lesser magnetic influence in the vicinity of a compass-needle is equal in effect upon it to a greater at a greater distance, an ascertained induced magnetic influence is used as a counterpoise, equivalent to counterbalance at equal angles from the true north the magnetism of the ships' iron or force of deviation.

RHODES, J., and J. JOHNSON. *Certain improvements in steam engines, part of which is applicable to pumps.* Application dated September 10, 1855. (No. 2048.)

This invention consists in constructing pistons, the packing rings of which are held in contact with the cylinder by steam acting within them; in constructing expansive governors, which consist of cams actuated by centrifugal force, so as to vary the quantity of steam admitted according as the work to be done varies; and in constructing slide valves, so as to exclude the steam from behind them; the valve-face and ports are formed, and the back is packed, as usual; a metallic ring works steam-tight against the interior of the cover of the valve casing, and the packing and this ring are adjusted by screws.

BELLFORD, A. E. L. *Improvements in paddle-wheels.* (A communication.) Application dated September 10, 1855. (No. 2049.)

This invention relates to paddle-wheels which have floats arranged obliquely, in pairs, in the form of the letter V, so that the vertex or angle of the V shall enter the water first; and it consists in attaching the floats by one end rigidly to a single wheel or central rim, and staying them from the said rim by stays. The floats are attached to the opposite sides of the wheel, may be set to any degree of obliquity required, and their outer ends may be wider than those next the wheel.

BELLFORD, A. E. L. *An improved governor for steam engines.* (A communication.) Application dated September 10, 1855. (No. 2050.)

The patentee describes an apparatus in which, as the speed of the engine increases, water is pumped into a vessel, thus raising a float, and thereby acting upon a rod and an inclined piece which closes the valve.

CRAVEN, T. *Improvements in furnace-bars.* Application dated September 10, 1855. (No. 2051.)

This invention relates to bars made up into endless chains. The short bars are each attached to an endless chain, which consists of a series of short links or plates, rounded at the ends, and each made with three holes, one at each end and the other in the middle. Each of the short bars is made with a projection at the under side, and at the middle of its length, such projection being wider than the bar, so that the neighbouring plates or links are thereby kept apart. The bars are fixed to the plates or links by rods passed through the under projections and through the middle or central holes of the links or plates, and the ends of the plates or links range under the bars next to those which are fixed to them.

GIMSON, J. *An improved feed apparatus for steam boilers.* Application dated September 11, 1855. (No. 2052.)

In this invention in the main water pipe connected with the boiler is inserted a piece of fusible metal, or a short length of gutta-percha pipe, or a plate of gutta percha, or of fusible metal, meltable at a sufficiently low temperature, so that, should the steam or heated water flow back from the boiler to the main pipe, it may melt the fusible metal, or gutta percha, and permit the steam, &c., to escape by the opening thus made in the supply pipe.

HINCHLIFF, G. S. *Improvements in the manufacture of paper-hangings.* (A communication.) Application dated September 11, 1855. (No. 2054.)

This invention consists in the application of velvet, silk, or satin, or of cloth or other suitable fabric (not in a state of flock) in the manufacture of paper-hangings. One method of carrying it into effect consists in first applying an adhesive substance to the back of a sheet of the fabric, and then cutting out therefrom figures or devices which are applied on the paper-hangings, having previously heated the paper. The adhesive composition which is preferred consists of shellac, mastic, and gum juniper, combined with a spirit, such as naphtha.

HEATON, T. *Improvements in pumps.* Application dated September 11, 1855. (No. 2055.)

In this invention it is proposed to use two separate working barrels, with a communication to keep the water in both pumps (when two are used) at the same level, and another to allow a column of water to fall upon the piston in the downward stroke to act as a balance weight; by connecting the two piston rods over a wheel or pulley, one will act as a counterbalance to the other. When one pump only is used, a weight will be required to act as a counterbalance to the column of water.

COUSENS, R. B. *Improvements in machinery or apparatus for making casks.* Application dated September 18, 1855. (No. 2068.)

This invention relates to a peculiar construction and arrangement of machinery or apparatus for curving and setting the staves of casks before being trussed, and consists mainly in the employment of a pair of bending rollers working in iron side standards, and driven by separate driving bands and gearing, in order to allow them to move slightly, towards or from each other, according to the varying thickness of the stave. Another pair is also carried by the standards, and situated, one in front of, and the other behind the former ones. The upper surfaces of the front and back rollers are slightly above the contact surfaces of the central ones, so that when a stave is passed through (in a steamed or heated state), it is set or curved.

BLISSET, J. *Improvements in the construction of revolving-chamber fire-arms.* Application dated September 13, 1855. (No. 2069.)

These improvements apply to the construction of the loading rod or lever of such fire-arms, by means of which the charge is thrust home. The lever employed is a lever of the second order (the fulcrum being attached to the "fore end"), and is provided near the fulcrum with a projecting lug, to which is connected a short link, also jointed to the rammer, which slides in a hole through the "fore end," and the action of the link allows the rammer always to preserve its parallel position as the lever is moved in ramming home.

SCULLY, V., and B. J. HEYWOOD. *Improvements in bottles, inkstands, and other vessels, and in caps or stoppers for closing the same.* Application dated September 14, 1855. (No. 2076.)

The object of this invention is to facilitate the closing and opening of vessels by the use of caps or covers which, without bands, clips, or wires, will retain their position. The caps or covers have studs formed on their interior, and these studs take into an inclined groove (or against the inclined under side of a shoulder), which, as the covers are turned, forces them down.

STOCKEN, F. *Improvements in carriage-springs.* Application dated September 14, 1855. (No. 2078.)

In this invention a carriage-spring is composed of two bent or cranked springs, connected together at the bends by coupling plates; two ends of the springs are attached to a half elliptic spring, and the other two ends to a bent bar by a brace, or it may be to a spring.

OXLEY, W. *Improvements in machinery or apparatus for washing fabrics and other substances.* Application dated September 15, 1855. (No. 2080.)

This apparatus consists of a steam-tight revolving drum, divided into compartments in which the fabrics are placed, and through which currents of steam and water are passed.

PROVISIONAL PROTECTIONS.

Dated January 21, 1856.

161. Gustav Adolph Blittkowski, of New York, United States. Improvements in repeating fire-arms.

Dated January 23, 1856.

181. Joseph Hopkinson the younger, of Huddersfield, York, engineer. Improvements in apparatus connected with steam boilers.

Dated January 24, 1856.

195. James Atkinson Longridge, of Fludyer-street, Westminster, Middlesex. Improvements in the construction of ordnance and other vessels intended to resist internal pressure, and in the manufacture and method of discharging projectiles.

Dated January 25, 1856.

201. George Gower Woodward, of Kidderminster, Worcester. Improvements in the manufacture of carpets.

Dated January 28, 1856.

223. Harvey Hilliard, of Glasgow, Lanark, N.B., cutler. Improvements in articles of cutlery, and in apparatus for sharpening and cleaning the same.

Dated February 1, 1856.

277. Peter Armand Lecomte de Fontainemoreau, of Rue de l'Echiquier, Paris. Certain improvements in the saponification of fatty matters. A communication.

Dated February 2, 1856.

291. George Napier, of Bath-street, Glasgow Lanark, engineer. Improvements in breaks for railway and other carriages.

Dated February 8, 1856.

337. Thomas Restell, of New Kent-road, Surrey, chronometer maker. Improvements in breech-loading and revolving fire-arms and in cartridges.

Dated February 13, 1856.

363. John Mills, of the firm of Mills and Whittaker, of Oldham, Lancaster, engineer. Certain improvements in the slide valves of steam engines.

Dated February 21, 1856.

447. James Durell Greene, of Craven-street, Westminster, gentleman. An improvement in breech-loading fire-arms.

Dated March 1, 1856.

525. William Crozier, of Sunderland, Durham, civil engineer. The better extinction of fire, street watering, and other purposes.

Dated March 13, 1856.

606. Christopher Duckworth and Thomas Marsden, of Manchester, manufacturers. The manufacture of a new or improved woven fabric.

Dated March 22, 1856.

684. William Henry Barlow, of the Midland Railway, Derby. Improvements in covering and constructing bridges, viaducts, floors, and other structures of a like nature, when iron is used.

Dated March 24, 1856.

693. Peter Brown, of Liverpool, Lancaster, corn merchant, and George Brown, of the same place, corn merchant. Certain improvements in sizing and stiffening textile materials or fabrics by the application of new materials for those purposes.

Dated March 28, 1856.

748. Samuel Getley, of Ivy-street, Birkenhead, Chester, plumber. Improvements in supplying and drawing water to and from cisterns.

Dated March 29, 1856.

752. Alexander Sands, of Manchester, iron founder. Improvements in securing rails in railway chairs, and in the construction of railway chairs.

754. John Swyney, of Massachusetts, United States. Improvements in breech-loading magazine fire-arms.

756. John James Rippon, of Oakenshaw Print Works, near Accrington, Lancaster, manufacturer. An improvement or improvements in rollers or cylinders for printing fabrics.

758. James Eives, of Cornhill, London. A new mode of preparing fibres from plants. A communication.

760. Herbert Newton Penrice, captain, R.E., Newcastle-upon-Tyne, Northumberland. Improvements in machinery for driving galleries through rock and other strata.

762. Charles Benjamin Normand, of Havre, France, shipbuilder. Improvements in steam boilers, in apparatus for applying heat to steam boilers, and economizing heat of furnaces.

764. Charles Durand Gardissal, of Bedford-street, Strand, London. Certain improvements in steam boilers. A communication.

766. Charles Durand Gardissal, of Bedford-street, Strand, London. A new compound of inflammable materials for the purpose of lighting fires in grates, stoves, furnaces, or other fire-places. A communication.

Dated March 31, 1856.

769. James Hicks, of Piddle Trenthide, Dorset, clerk. Improvements in stoves.

770. Benjamin Looker the younger, of Kingston-upon-Thames, Surrey, brick and tile manufacturer and potter. An improved mark or indicator to be let or fixed into the ground in burial-grounds and other places.

771. Charles Jean le Mélorel de la Haichois, of Rue de l'Echiquier, Paris, advocate. Certain improvements in paving.

772. Henry Henderson, of Glasgow, Lanark, N.B., plumber. Improvements in stop-cocks or valves.

773. Charles Parker, of Dundee, Forfar, N.B., manufacturer. Improvements in machinery or apparatus for winding yarns or threads.

775. Thomas Waller Burrell, of Fareham, Hants, civil engineer. Improvements in machinery for obtaining power by water. A communication from Messrs. Mesuier and Cheneval, of Pontoise, France.

776. Henry Cornforth, of Birmingham, Warwick, manufacturer. A new or improved manufacture of plated tea pots and coffee-pots, and other vessels and articles of like manufacture.

777. Alexander Prince, of Trafalgar-square, Charing-cross. Improvements in steel pens, for regulating the elasticity thereof. A communication.

778. George Thomas Smith, of Northampton, and Joel Watts, of Battersea, Surrey. An improved lubricator.

779. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improved machinery for folding paper. A communication.

Dated April 1, 1856.

780. Joseph Bentley, of Liverpool, Lancaster, gun manufacturer. Improvements in breech-loading fire-arms, and in the cartridges to be used therewith.

781. Charles Baptiste, mechanician, of Toulouse, France. Improvements in machines for manufacturing tenons and mortices. Partly a communication of Pierre Maybon, of Toulouse.

782. James Ashton, of Hyde Corn Mills, Hyde, Chester, miller. Improvements in machinery or apparatus for bruising or breaking grain or other matters, preparatory to grinding.

783. Alfred Southam, of Manchester, Lancaster, agent, Samuel Stead, of Manchester, broker, and James Martin, of Manchester, fent dealer. Separating or recovering the vegetable substances from mixed fabrics, and rendering the same vegetable substances again available for manufacturing purposes.

784. Armand Louis André Herbelot, gentleman, of Paris. A new method of obtaining a continual motive power.

785. Etienne Laporte, chemist, of Paris. The application of certain new materials in the manufacture of bougies, candles, and other similar articles.

786. John Gray, of Peckham, Surrey, engineer. Improvements in steam boilers, furnaces, and fire-bars.

787. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improved apparatus for ascertaining gradients. A communication.

788. William Roberts, of Millwall, Poplar, Middlesex. Improvements in the construction of pumps.

789. John Paterson, of Linlithgow, N.B., engineer. Improvements in the manufacture of paper.

Dated April 2, 1856.

790. Frederick Grice, of West Bromwich, Stafford, manufacturer. New or improved machinery for the manufacture of bolts, rivets, spikes, screw blanks, and nuts.

792. Richard Roberts, of Manchester, engineer. Improvements in omnibuses and other passenger carriages.

793. Peter M'Gregor, of the Falcon Works, Manchester, machine maker, and Thomas Marquis, of Huncoat, near Accrington, Lancaster, spinner. Certain improvements in the machines for spinning called throstles.

794. James Smith Cottrill, of Great Lever, near Bolton, Lancaster, bleacher. Improvements in presses.

795. Charles Ellis, of Stockport, Lancaster, throstle overlooker. Certain improvements in machinery or apparatus for spinning and doubling cotton and other fibrous substances.

796. George Bell Galloway, of Basinghall-street, London, engineer and shipowner. Improvements in propelling vessels.

797. Lodowiska Bonnard, of Tottenham-court-road, Middlesex. Inprovements in collapsible or folding hats and bonnets, and in flexible articles to be applied to other coverings for the head. A communication from his father, Jean Baptiste Bonnard, of Paris.

798. George Gwynne, of Trafalgar-square, Middlesex, esquire. Improvements in treating fatty, oily, and greasy bodies.

799. Henry George Hine, of Brecknock-street, Camden-town. Improvements in children's and invalids' carriages, called perambulators.

800. Henry Smith, of Lee, Kent, gentleman. Apparatus for cleaning and polishing boots and shoes.

801. James Samuel, of Great George-street, Westminster, civil engineer, and John Nicholson, of Bow, Middlesex, engineer. Improvements in steam and other vapour engines.

802. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in the construction of rotary steam engines, applicable in part to pumps for raising and forcing fluids. A communication from John Broughton, of the city of Chicago, United States.

Dated April 3, 1856.

803. William Jenkins, of Neath Abbey, Cadoxton-juxta-Neath, Glamorgan, moulder. A new and improved method of manufacturing copper rollers for calico printing.

804. Edmund Alfred Pontifex, of Shoe-lane, London, manufacturer, and William Needham, of Vauxhall, Surrey, engineer. Improvements in the manufacture of preparations or primings used for preparing canvas, wood, or other material for the reception of pigments or colours.

805. Charles Colonel Smith, of Wolverhampton, Stafford, innkeeper. A new or improved method of working brakes for stopping machinery used for raising coals and minerals, and for stopping steam engines and other motive power engines.

806. William Billinton, of Great George-street, Westminster, civil engineer. Improvements in strengthening and preserving wood and timber.

807. Henry Robert Abraham, of Essex House, Barnes, Surrey. Improvements in passenger, exhibition, or delivery tickets or checks, and in the method of indicating and recording passenger traffic, or delivery of goods, and in the machines used as tell-tales for such purposes.

808. Thomas White, junior, of Portsmouth, Hants, engineer and ship-builder. Improvements in slips and ways for receiving ships or vessels requiring repair, and for apparatus to be used for hauling up ships or vessels.

809. Frederick William Kitson, of Leeds, York, engineer. Improvements in the manufacture of railway wheels.

810. John Hamilton Glassford, of Glasgow, Lanark, N.B., lithographer. Improvements in the production or preparation of printing surfaces.

811. James Bannehr, of Exeter. An improvement in manufacturing or preparing paper for, and in mounting copies of, written documents thereon.

812. John Fernie, of Forrester-street, Derby, en-

gineer. Improvements in hoists by combining steam and a hydraulic column.

Dated April 4, 1856.

813. Paul Emile Chappuis, of the Patent Reflector Factory, Fleet-street, London. Improvements in looking-glasses to render them double reflective.

814. Robert Halliwell, of Bolton-le-Moors, Lancaster, manager to Messrs. Benjamin Dobson and Edward Barlow, machine-makers. Certain improvements in the machines for spinning called self-acting mules. A communication.

815. Charles Durand Gardissal, of Bedford-street, Strand, London. The treatment of preparation of fabrics or textile materials to be dyed or printed. A communication.

816. Samuel Fisher, of Birmingham, Warwick, engineer. Improvements in the manufacture of anchors, shafting for mill and engine purposes, axles, cranks, and spindles, and in the furnaces or muffles used in the said manufacture.

817. John Roberts, of Upnor, Kent, terra cotta manufacturer. Improvements in the manufacture of ornamental tiles.

818. Charles William Ramié, of Denbigh-street, Pimlico, Middlesex. Improvements in constructing the permanent ways of railways.

819. George Tomlinson Bousfield, of Loughborough-road, Brixton, Surrey. Improvements in moulding planes. A communication.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

862. Peter Bancroft, of Edmund-street, Liverpool, Lancaster, oil merchant, and Stephen White, of Bond-street, Liverpool, Lancaster, manufacturing chemist. A method of manufacturing certain oils or oily substances obtained from the petroleum, commonly called earth oil, found in certain districts of the Birman Empire and elsewhere. April 10, 1856.

868. Lewis Normandy, of Judd-street, Brunswick-square, Middlesex, civil engineer. Improvements in the mode of writing and printing music to facilitate the study thereof. A communication from l'Abbé Eugène Cormier. April 11, 1856.

900. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. Improvements in surface or fresh water condensers, chiefly applicable to steam engines. A communication from Nathan Thompson, junior, of Williamsburgh, King's County, New York, United States. April 15, 1856.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," April 22nd, 1856.*)

2780. John Hall. Improvements in Jacquard looms.

2784. David Parsons. An improved brake for arresting or retarding at will the motion of locomotive and other engines, and revolving machinery.

2804. Rogers Ruding. An improvement in printing silks and other woven fabrics with gold and other metal leaf or powder.

2810. William Leighton. Improvements in paddle-wheels.

2811. Richard Holben. Improvements in apparatus for chopping barley.

2814. David Hart. Improvements in signalling or communicating between parts of a railway train, and in the instruments and apparatus employed for such purpose.

2828. John Walter Friend. An improved registering log and deep sea lead.

2827. Charles John Todd and Robert Pinkney. A balance pen.

2834. Edward Brown Hutchinson. An improved apparatus for forming and cutting elliptical figures.

2840. Samuel Stewart. An improved combined engine and gas exhauster, and also improvements in the valves of such exhausters.

2857. William Wilkinson. Improvements in machinery employed in the manufacture of looped fabrics.

2862. David Lloyd Price. Improvements in electric telegraphs and in appliances connected therewith as applied to railway trains and fixed stations.

2867. Frederick Robert Augustus Glover. An improved instrument or apparatus for taking angles, and measuring lines, surfaces, and solids, and ascertaining the variation of the needle.

2868. Frederick Robert Augustus Glover. Improvements in the construction of breakwaters, sea-walls, and other structures, or foundations of structures which lie partially or entirely under water.

2895. Edward Tyer. Improvements in telegraphing or communicating by means of electricity.

2900. Myles Kennedy and Thomas Eastwood. Improvements in pump buckets, which improvements are also applicable to lift pumps, air pumps, and all similar apparatus.

2904. Christopher Dresser. Improvements in the mode of effecting what is called "nature printing."

2934. John Robinson, Richard Cunliffe, and Joseph Anthony Collett. Improvements in locomotive steam-engines, and in springs for locomotive steam-engines, and other purposes.

2943. Hebrert Redfern. Improvements in skates.

2945. John Broadbent and Stanley Peter Youle. Improvements in machinery or apparatus for cutting out the gores of umbrellas and parasols, which said improvements are also applicable to cutting out forms or shapes for other purposes.

161. Gustav Adolph Blittkowski. Improvements in repeating firearms.

195. James Atkinson Longridge. Improvements in the construction of ordnance and other vessels intended to resist internal pressure, and in the manufacture and method of discharging projectiles.

223. Harvey Hilliard. Improvements in articles of cutlery and in apparatus for sharpening and cleaning the same.

245. Abraham Pope. Improvements in the manufacture of iron, copper, tin, and lead.

269. Thomas Hurst. Improvements in the connecting of the rails or metals generally used on railways.

270. John Henry Johnson. Improvements in gas burners and in regulating the combustion of gas. A communication.

378. Henry Robert Ramsbotham and William Brown. Improvements in combing wool, alpaca, cotton, and other fibrous substances.

525. William Crozier. The better extinction of fire, street watering, and other purposes.

581. Pierre Denis Nolet. Improvements in penholders.

593. Henry Horner and Richard Bagley. Improvements in buffers, and draw and bearing springs for railway and other purposes.

604. George Murray. An improvement in the construction and manufacture of wheels, for locomotive engines, waggons, and other carriages to be used on railways.

650. Lazare Ochs. Improvements in the manufacture of certain kinds of paper from the refuse of tanned leather. A communication.

651. Richard Morgan. A cellular purse.

709. James Hargraves. Improvements in the apparatus used for dyeing fabrics.

722. George Smith. Envelopes for containing letters or documents.
735. James Cliff. Improvements in machinery for cleansing casks.
751. Alfred Vincent Newton. An improved air engine for producing motive power by heated air. A communication.
770. Benjamin Looker, the younger. An improved mark or indicator to be let or fixed into the ground in burial-grounds and other places.
779. Alfred Vincent Newton. Improved machinery for folding paper. A communication.
783. Alfred Southam, Samuel Stead, and James Martin. Separating or recovering the vegetable substances from mixed fabrics, and rendering the same vegetable substances again available for manufacturing purposes.
787. Alfred Vincent Newton. Improved apparatus for ascertaining gradients. A communication.
798. George Gwynne. Improvements in treating fatty, oily, and greasy bodies.
799. Henry George Hine. Improvements in children's and invalids' carriages, called perambulators.
862. Peter Bancroft and Stephen White. A method of manufacturing certain oils or oily substances obtained from the petroleum, commonly called earth oil, found in certain districts of the Birman Empire and elsewhere.
868. Lewis Normandy. Improvements in the mode of writing and printing music to facilitate the study thereof. A communication.
900. George Tomlinson Bousfield. Improvements in surface or fresh water condensers, chiefly applicable to steam-engines. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

BETTS' AND LONGMAID'S APPLICATIONS FOR PROLONGATION OF PATENTS.

The Judicial Committee of the Privy Council have appointed the 16th June next for the hearing of the petitions in the above matters.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

898. Moses Robinson.
906. John Wallace Duncan.
916. George Titterton.
935. William Fawcett and Francis Best Fawcett.
938. François George Sicardo.
943. Frederick Henry Smith.
957. Sir William Snow Harris.
959. Thomas Dunn.
960. Charles Reeves, junior.
964. Philip Harris.
981. Henry Holdsworth.
983. William Johnson.
1010. John Hetherington, John Dugdale, the younger, and Edward Dugdale.
1201. Peter Armand Lecomte de Fontainemoreau.

LIST OF SEALED PATENTS.

1854. *Sealed April 18th, 1856.*

1765. John Benjamin Daines.

This patent bears date 12th August, 1854; time being allowed for filing specification by the Lord Chancellor.

1855.

2339. John Cheesman Wagstaff.
2344. William Smith.
2352. Pierre Antoine Henry Parant.
2355. Frederic Whitaker.
2360. Alexander McGlashan and Edward Field.
2361. Charles Lenny.
2410. Joseph Whitworth.
2419. William Naylor.
2426. Thomas Webster Rammell.
2487. Richard Archibald Brooman.
2532. Alfred Vincent Newton.
2582. Charles Crum and Charles Paul.
2614. William Harvey.
2630. Alexandre Tolhausen.
2672. Edward Payton and Duncan Morrison.
2826. George Tomlinson Bousfield.
2828. Edward Orange Wildman Whitehouse.
2839. William Clay.
2894. James Murdoch.
2923. Thomas Duppa Duppa.

1856.

38. George Tomlinson Bousfield.
117. John Hamilton, junior.
119. John Hamilton, junior.
273. Edward Schischkar.
294. William Goodman.
350. Louis Schwartzkopff.
354. William Horatio Harfield.
384. William Hamond Bartholomew.
470. Henry Loveridge.
484. Edward Slaughter.

Sealed April 22nd, 1856.

2369. John Bellamy.
2378. John Healey, John Foster, and John Lowe.
2383. Charles Crickmay and Frederic Joseph Clowes.
2385. Eugène Hippolyte Rascol.
2387. Henry Tritton.
2389. James Platt and John Whitehead.
2393. John Pinches.
2397. Edward Stark.
2408. George Riley.
2467. William Prior Sharp and William Weild.
2475. Arthur Dobson.
2483. George Baring Locke.
2495. Edward Jeffreys.
2521. John Raywood.
2525. William Henry Walenn.
2687. Richard Archibald Brooman.
171. Joseph Francis.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
March 28	2822	Negretti and Zambra	Hatton-garden	Glass instrument for measuring fluids.
,,	2823	C. Ford	Hanley	Portable heater.
April 3	2824	Ransome and Sims	Ipswich	Mill-frame.
8	2825	E. Smith and Sons	Leeds	Mourning coat.
10	2826	E. Edwards	Birmingham	Insect-trap.
12	2827	R. Pease	Bradford	Pressure-gauge.
15	2828	J. Lowe and M. Pollack	Birmingham	Guard for Penholder.
16	2829	J. Manuel	Sheffield	Reclining chair.
17	2830	W. Sugg	Westminster	Gas governor.
,,	2831	J. Palmer and Son	Camberwell	Vesuvian case.

PROVISIONAL REGISTRATIONS.

March 28	758	T. W. Crosby	Scarborough	Carriage-drag.
April 5	759	C. Gammon	Bloomsbury-square	Spring watch-protector.
7	760	T. Dyke	Darlington	Cricket-stump.
15	761	T. Gullick	Pall-mall	Carlton-boot.
16	762	J. Leetch	Cavendish-square	Recourse fork.
22	763	F. Staples	St. George's-road, Southwark	Revolving stand for teaching music.

NOTICE TO CORRESPONDENTS.

The publication of several Articles and Letters is deferred.

CONTENTS OF THIS NUMBER.

Lark's Patent Smokeless Furnace (*with engravings*) 385
Faraday's Experimental Researches in Electricity (*continued from page* 319) 387
Note on Tonnage Admeasurement (*with engravings*) 392
Screw Steamers for the Rivers of India 394
A Plan for Securing the Beams of Ships, by Lieut. Cunningham 394
Woodcock and Gardner's Patent Furnaces 395
Mechanical Locomotion 397

Specifications of Patents recently Filed:

Grenet ..... Electro Magnetic Apparatus 399
Panet ..... Railways 399
Hewett ..... Baking Ovens 399
Sharpe ..... Closet Pans 399
Bull ..... Permanent Way 399
Lebaigue ..... Making Chocolate 399
Curtis and Wain ..... Spinning Cotton 399
Kennedy ..... Telegraph Signals 400
Bouchard ..... Producing Gas 400
Higgin ..... Treating Madder 400
Macintosh ..... Springs 400
Spilsbury & Emerson ..... Paints 400
Proger ..... Ships' Lanterns 400
Barber, Butterfield, and Austin ..... Mangles 400
Macintosh ..... Pens 400
De Lucenay ..... Guns and Pistols 400
Tuck ..... Submarine Operations 401
Longbottom ..... Gas 401
Hartmann ..... Colours for Printing 401
Garbai ..... Preserving Teeth 401
Church ..... Fire-arms 401
Gomme and Beaugrand ..... Metal Wares 401
Dewdney ..... Chest Protector 401
Thomas ..... Sewing Machines 401
Wohlgemuth ..... Bridges 402
Martien ..... Iron and Steel 402
Chandler ..... Roasting-jacks 402

Provisional Specifications not proceeded with:

Balestrini ..... Insulating Wires 402
Robertson ..... Textile Fabrics 402
Allan ..... Correcting Compass Deviations 402
Rhodes & Johnson ..... Steam Engines 402
Bellford ..... Paddle Wheels 403
Bellford ..... Governors 403
Craven ..... Furnace-bars 403
Gimson ..... Feeding Boilers 403
Hinchliff ..... Paper-hangings 403
Heaton ..... Pumps 403
Cousens ..... Cask Machinery 403
Blisset ..... Revolvers 403
Scully & Heywood ..... Bottles 404
Stocken ..... Carriage Springs 404
Oxley ..... Washing Machine 404

Provisional Protections 404
Patents applied for with Complete Specifications 406
Notices of Intention to Proceed 406
Betts' and Longmaid's Applications for Prolongation of Patents 407
Patents on which the Third Year's Stamp-Duty has been Paid 407
List of Sealed Patents 407
List of Designs for Articles of Utility Registered 408
Notices to Correspondents 408

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1708.] SATURDAY, MAY 3, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

DALE'S MACHINE FOR WORKING WOOD MOULDINGS.

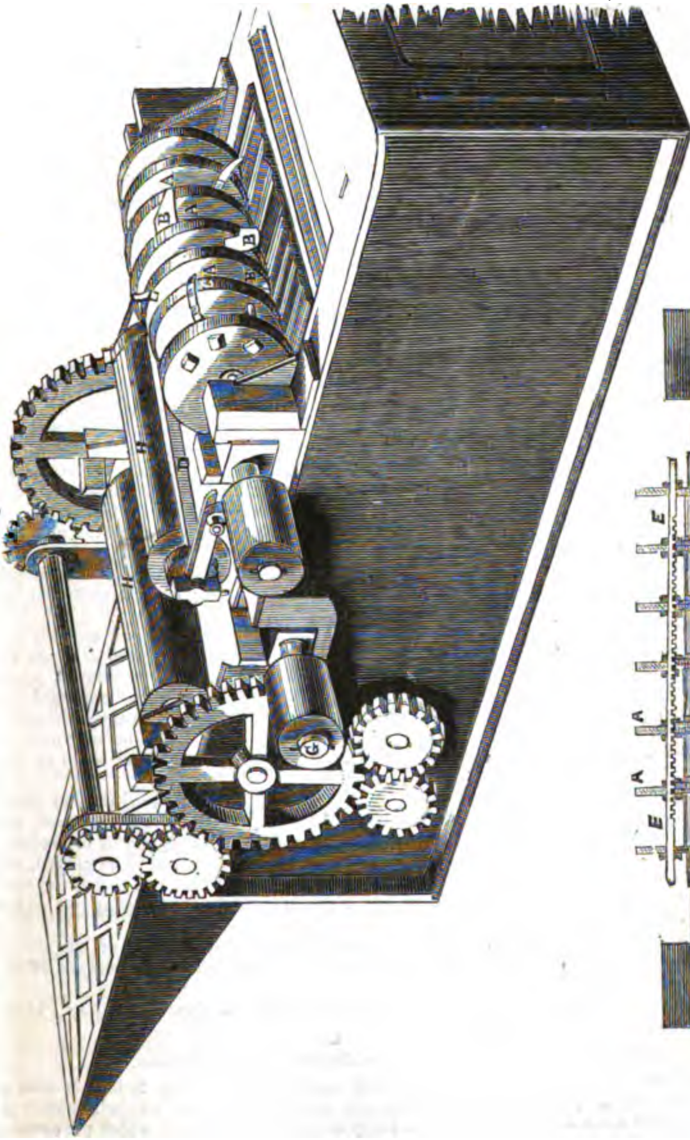


Fig. 1.

Fig. 2.

DALE'S MACHINE FOR WORKING WOOD MOULDINGS.

The Committee on Science and the Arts, constituted by the Franklin Institute, to whom the above machine, the invention of Mr. J. D. Dale, of Philadelphia, was referred for examination, have reported upon it in the *Journal* of the Institute as follows:

That the invention and improvement consists in arranging a series of moulding cutters, or plane bits, side by side, along the length of, and around the axis of rotation, and securing them between adjustable cutter-heads, capable of being moved to conform with the size of the moulding designed to be worked. Combining therewith rotating saws, or their equivalents, for slitting or separating the several mouldings at the same operation.

The improved part of the machine may be described, as the rotating cutter-head, and the mouth pieces.

The cutter-head consists in a series of circular discs about six or seven inches diameter, arranged upon a horizontal shaft, the two outer ones secured thereto near to the ends, and to four horizontal guide rods placed equidistant, and near to the peripheries; all the interior discs have horizontal motion upon the shaft and the guide rods.

These guide rods have cogs on their inner surfaces, and mesh in gear with the threads of screws formed on the periphery of hubs, surrounding the shaft, and capable of moving around and laterally over the same, being confined in concentric spaces formed in the disc, by means of plates on either side, in such manner as to enable the hubs to be turned, whereby the screws on the peripheries operate on the cogs of the guide bars, and move the discs towards each other, to gripe and hold the cutters inserted in grooves between them.

The stationary and moveable discs have each one or more teeth, acting as saws, secured on their peripheries, of a sufficient projection beyond the moulding bits, for slitting the plank to the required widths of the mouldings.

The horizontal shaft with its rotating stock of plane irons, is mounted in boxes of a suitable form provided with the usual fixtures for feeding, guiding, and sustaining the plank. And upon each end of the shaft is hung an arm, having a bar with a slot in it, extending nearly its whole length; to the under surface of which bar, are secured a series of plates of hard wood, by means of screw bolts passing through the slots, so that the plates can be shifted at pleasure for adjustment. There is one of these plates for each set of moulding cutters, viz.: for each division of the rotating stock, and the forward edge of each plate respectively fits close and accurately to the contoured edge of the cutters, being formed by shifting or pressing them forward upon the cutters sufficiently for the purpose, when the head is in operation.

This part of the improvement is called the mouth-piece, its advantages being in all respects like to the same parts of the plane preventing the skelfing or splintering of the plank by the cutters during the planing of the moulding.

It will thus be seen, that any number of moulding bits may be arranged around, and secured side by side between the discs, on the same shaft, with slitting teeth or saws for dividing each set; or the slitting saws upon the inside discs may be removed, and the whole or any required width of moulding, number of members, &c., desired, may be worked out at one and the same passage of the plank through the machine. It appears to the Committee to work well, with or against the grain of the wood, and with speed; the time occupied in working the whole width of a board into a number of mouldings being about equal to that of a single moulding in machines heretofore in use.

The rotating head of the machine seen in operation by the Sub-Committee had but a single cutter to each moulding, and the dividing saw tooth; yet the work produced was sufficiently smooth for a distance of fifteen to twenty feet from the eye, and in the opinion of the Committee, if two or more bits were to be used on each surface to be planed, the work would be sufficiently smooth for the usual purposes near to the eye. But for such use Mr. Dale finds it more economical to finish the mouldings by planing off a few shavings by hand.

The improvement appears to be new, and of sufficiently useful importance to the arts to warrant the Committee in recommending it to the Board of Managers for the award of the Scott Legacy Premium.

These improvements of Mr. Dale were patented on the 4th day of January, 1853; and on the 10th day of October, 1854.

Description of the cuts (on the preceding page) by the inventor.

Fig. 1, represents a perspective view of the improved machine. Fig. 2, is a section of the rotating cutter-heads, and parts for moving and securing the same on their shaft. A, are the cutter head discs or circular plates, with grooves, in and between which the cutters, B, are secured. C, are the teeth secured to the discs or circular plates, for slitting the board or plank to the required width of the mouldings, after the manner of a circular saw.

D, is the mouth-piece frame, so suspended and secured in relation to the cutters, as to enable the contoured edges of the mouth-piece, corresponding in every respect with the form of the cutters to press upon, the edge of the plank being moulded immediately next where the cutting is being performed, so as to prevent skelfing or splintering of the plank by the cutters during their cutting process. E, are the cogged bars for moving the discs and securing the cutters in the grooves between them. F, are the hubs having screw threads on their peripheries which mesh in gear, with the cogs of the bars, E, and being secured between plates secured to the discs or circular plates, A, in such a manner as to enable the latter to be moved by the turning of the hubs. G, is the lower cutter head shaft for planing the lower surface of the plank. H, are the feed rollers. I, are the ends of a series of mouldings in the act of being planed to the required form, by the cutters, B, and separated by the teeth, C.

ON LARGE BELLS AND BELL MACHINERY.

(*Continued from page 365.*)

REMARKS ON THE FORMS, METOHDS OF CASTING, AND RINGING OF LARGE BELLS.

BY C. H. SMITH, HONORARY MEMBER.

Read at the Ordinary General Meeting of the Royal Institute of British Architects, January 14th, 1856.

THE subject for consideration this evening is rather of an unusual kind, but I wish it to be thoroughly discussed, and only to be allowed myself to act as one of the speakers.

The old saying, that "it is much easier to find fault than to suggest a remedy," is perfectly true in the present instance. The long-established system connected with the manufacture and use of large bells, is attended with many inconveniences; and an opening for improvement exists in the form, the mode of casting, and the usual method of ringing them. There is scarcely a bell-tower in the kingdom which is not shaken, and in some cases the ringing is altogether discontinued, for fear of the oscillations bringing down tower, bells, and ringers to the ground in one common ruin.

Mr. Ferrey, who has had frequent opportunities of becoming acquainted with the subject, has written to me as follows:

"You wish me to state what I have observed in the towers which have come under my professional notice. My remarks apply rather to the bad consequences of the mode of bell hanging hitherto adopted, arising from neglect or ignorance, rather than from the principle upon which bells are hung. Still, if some plan of bell-hanging could be adopted less liable to derangement, much mischief to church towers might be avoided.

"In my examination of ancient churches, I have frequently had to deplore the serious injuries caused to the towers by the action of the bells. However judiciously they may be arranged within the framework, there will be some unequal strains upon parts of it; no sooner do the ringers find a difficulty in raising the bells, owing to the want of a proper bearing on the gudgeons, than they wedge up the framework of the bells from the walls, mullions, or any masonry nearest to the point where the bell which works heavily is placed; no attempt is made to brace the woodwork, and so remedy the defect. The disastrous effects of this slovenly system are obvious; the vibration arising from the revolution of the bells is at once thrown against the walls, and the damage resulting from it becomes very soon apparent. In some central towers I have observed much injury to the supporting arches and piers, as in the case of the tower of Othery Church, near Bridgewater, the structure was rendered dangerous by the manner in which the tower piers were split and crushed by the action of the bells. In many instances, the belfry chambers are closed against the ringers, and the bells are only permitted to be tolled, owing to the dangerous condition of the towers. Very recently steps have been taken to rebuild the upper part of the spire of Bellbroughton Church, near Stourbridge, the masonry of which was so loosened by the vibration of the bells as to become quite dangerous. Many other instances have come under my notice of the serious results arising from bad bell-hanging, and ignorant attempts to remedy the evil."

I may also call your attention to the following remarks by the Rev. W. C. Lukis, in the Wiltshire Archæological Magazine:

"I have seen in the course of my Wiltshire rambles Church towers which are in so dangerous a state that the bells are forbidden to be rung. This arises from two causes. First, bells formerly were not subject to the same oscillations as now. They were swung to and fro very gently compared with the present wild summersaults of change ringing, an art of comparatively recent date. Consequently, in constructing towers, the architects of those days had not to take into their calculation the great vibration of the walls produced by the violent motion of the bells. In 1810, the spire of St. Nicholas'

Church, Liverpool, fell as the people were assembling for service, and killed twenty-three persons. This catastrophe was partly caused by the vibration of the bells. Any one who has stood in the belfry of the lofty and beautiful tower of Magdalen College, Oxford, when a peal is ringing on its ten sweet-toned bells, knows the way in which a tower is made to sway."

That the process of throwing bells up and down is inconvenient as well as dangerous, is proved by the fact, that nearly all large bells are struck on the outside with a hammer.

The most sonorous material for bells is found to be a mixture of copper and tin in certain proportions, generally four parts copper to one of tin. It is an error to suppose that silver enters largely into the composition of some bells, though the recently discovered metal, aluminum, is said to be very sonorous. The greatest care is requisite during fusion not to heat the materials more than absolutely necessary; and when melted and sufficiently hot, to commence casting them with as little delay as possible; for metals in a fluid state may be distilled or sublimed by heat like other liquids; consequently, the tin being melted at a much lower temperature than the copper, will be driven off in a sort of aëriform or vaporous state; therefore, in order to be certain that, when the bell is finished, it shall contain the proper quantities of each metal, great importance must be placed on putting in the tin at a proper time, or, when the cast is completed, its composition will be different in its proportions from what was intended.

It is a practice to pour hot metal into a cold mould, or into a mould that has been warmed on the surface, by pouring a small quantity of the fluid metal into it, and then letting it run out again before it has become solid; this plan will give a momentary warmth to the surface of the mould, or may warm it to the depth of half an inch, but it will not prevent the hot fluid metal when poured in from becoming solid wherever it touches the mould, while the interior of the mass will still remain in a liquid state. Under such circumstances, the cast will be tolerably fine-grained, solid, and compact, where the metal has first cooled, that is, wherever it has come in contact with the mould; but inside, where the fluid metal has not been so immediately cooled, the texture will be coarse-grained, porous, and highly crystalline.

Whatever the general external and internal form of a bell may be, the plainer the surfaces the better will be the sound; all mouldings, inscriptions, dates, and every kind of ornament, whether projecting or indented, should be avoided, as they interrupt the free vibration of sound in proportion as the relief is high or low.

To produce sound, bells are usually struck by a clapper within, or by a hammer on the outside; such continued battering upon a cast, or crystalline substance must, sooner or later, crack the metal. This may happen soon after the bell is placed in the belfry, or not for several centuries. A number of comparatively insignificant hammerings, or concussions, will produce a very surprising effect, if continued for a long period. The fracture may, at first, be so trifling as to be almost inappreciable by the most refined ear; but every stroke of the clapper will increase the evil, until the vibrations of the metal are so interrupted that, instead of a long-continued harmonious sound, an unpleasant jarring noise is produced, and the bell becomes useless. Mr. W. L. Baker's patent plan, proposed in his paper on bells read here last year, of gradually turning the bell round, is a great improvement.

Various circumstances have led me to consider whether a totally different form from that usually given to bells might not be introduced with advantage.

Solid masses of metal, formed in a particular shape, and suspended in a certain way, when struck with a hammer, will give very melodious sounds. For example, take a sound lump of soft steel, forged in the shape of a spindle, or of two cones of the same diameter, but of unequal heights, and united at their bases—each cone bearing a relative proportion to the other, either in its cubical contents or superficial area—the larger one to be three, four, or five times the size of the smaller; suspend this at the largest diameter, or nodal part, by two pins or trunnions, and strike it with a hammer near the centre of gravity of the whole mass; it will vibrate freely, and give a long-continued musical sound. Or take two pieces of metal, formed precisely of the same shape and dimensions as the last, one of soft steel, the other of bell-metal, and suspend them in a similar manner; if these two be struck at the same instant, either with a hammer or against each other—care being taken that the striking point is near the centre of gravity of each—the sound will be a loud, musical chord, of a very harmonious kind.

Coarse-grained, crystallized substances are not so sonorous as those which are of a closer and more compact texture. Glass is extremely sonorous, and the sweetest tones may be produced from it.

It must be evident that the entire subject of bell-casting should be thoroughly investigated, especially at the present time, when we have a grand building at Westminster nearly completed, with a clock-tower waiting for its bells, one of which is to weigh

14 or 15 tons, and the prime cost of the metal only for this one bell cannot be estimated at less than £1,700. I feel that the credit and character of scientific men is involved in the transaction. For, if they would turn their attention to the subject, it is extremely probable that some plan might be discovered to answer the purpose of ponderous bells, with a considerable saving of metal, and much less difficulty of ringing.

In conclusion, I beg to make the remark, that a long habit of considering an established practice as not wrong, gives it a superficial appearance of being right. I am, therefore, afraid that popular prejudice will be such a formidable barrier against improvement, that no innovation in bells will be tolerated, except by almost imperceptible gradations.

But surely, in these days of invention, when we live, as it were, in an atmosphere of steam power—when our words are sent, almost as quick as we can utter them, to the further end of a wire hundreds of miles in length—when the portraits of living creatures, or other complicated objects, can be produced in an instant by a flash of light—it cannot be too presumptive to expect that, after a lapse of many hundred years, with the help of philosophic investigation and mechanical science, we should be able to suggest some beneficial modifications in the forms, methods of casting, and ringing large bells. I will, therefore, conclude with the hope that some hints may be taken from my remarks, and that the discussion, which I trust will now follow, may lead to further useful results.

Mr. C. Barry, Fellow, said that the thanks of the meeting were due to Mr. Smith for bringing forward not only the subject of the casting of bells, but also points which were useful to them as architects; and especially the question of the degree of strength necessary for bell-towers. If, as Mr. Smith stated, the mode of ringing bells was different now from that formerly practised, he hoped the subject would elicit much valuable information from gentlemen present who were peculiarly qualified to impart it.

Mr. Cornelius Varley, Visitor, said the subject of bells divided itself into two parts; one, how to obtain the best bell with the least weight of metal; and the other, how to support the bells and obtain the most of their sound with the least injury to the building. If bells were hung in the open air, over the conical roof of a tower or support suitably constructed for such moving weight, the cone below would spread their sound right and left; and if their cover were a large sounding board, we should obtain the most effect from a given weight of metal. He had witnessed the full effect of sound and smooth bells on the occasion of Lord Macartney's embassy to China, near the end of the last century, when two splendid musical snuff-boxes were taken as presents to the Emperor. To obtain the utmost perfection, the musical part, and the tuning and fitting the bells, were entrusted to his late uncle, Mr. Samuel Varley; and though the bells were smoothly cast, in that state, they were like bells in dampers when compared with the musical sound from the truly turned and polished bells. The inside being made quite true to the outside, caused the entire co-operation of the whole bell to produce the sound. In cast bells, there was not only the rough surface, but inequality of thickness, a cause of discord inimical to the sound, and lessening its duration. This, in large bells, was very difficult to avoid, and in thick castings, the two surfaces cooling first, often left a division within, a still greater cause of bad sound. To illustrate this Mr. Varley exhibited a sectional drawing of a casting in brass for an air-pump plate, ten inches diameter; finding it unsound (by the trial of ringing), he forced air in so violently as to separate the two surfaces three-eighths of an inch, and on cutting a piece out, found the division was eight inches diameter; this defect occurred so often in ordinary castings, that he suspected bells could not always be free from it. In his own experience, he had found that metal cast in a hot mould cooled with a crystalline interior. Lord Rosse, by casting on a cold face, had succeeded in getting a sound mass all through.

The Rev. W. Taylor, Visitor, referred to his statement last year, that the great bell at York had never been rung up to set. That statement had been contradicted by Messrs. Mears, who wrote, that it had been completely raised and fairly rung by sixteen men. He (Mr. Taylor) had, however, sent to York for an official report on the subject, and the report was, that the bell had never been rung up to set. He was himself at York in October last, and found that, in fact, although thirty-six men had tried it, the bell had never been set; indeed, with the present hanging, it never would be. At Erfurt, the bell, which weighed 275 centner,* was rung up to set by twenty-eight men. That bell was not cut into the stock as at York; the latter method took from the centrifugal force, and made it impossible to get up the bell. The different sounds of different metals was an interesting question, and on that point he would remind the meeting, that at St. Nicholas, Hamburgh, very large tuning-forks of cast-iron were struck

* Each centner = about 110 lbs. Therefore, 275 centners = 275 × 110 lbs. = 30250 lbs. = 13·5 tons.

instead of bells. The continuance of the sound, and the power to be heard at a great distance, were the principal tests of a good bell.

Mr. B. Denison, Visitor, having been invited to state his views on the subject, expressed the interest he felt in it, as having been intrusted to give directions for casting the large bells for the Westminster clock; but there would be hardly time for him to explain his views on the present occasion.

The further discussion was accordingly adjourned to January, 28th instant.

(*To be continued.*)

PROPOSED CANAL BETWEEN THE ATLANTIC AND PACIFIC OCEANS.

On the evening of Tuesday, April 22, Mr. F. M. Kelly, of the United States, read a paper on the junction of the Atlantic and Pacific Oceans, and the practicability of a ship canal, without locks, by the valley of the Atrato, at the Institution of Civil Engineers.

The route, more especially advocated in the paper, would commence on the Atlantic side, at the Estuary of the Atrato, by widening and deepening one of its entrances, removing the sand bars, and stopping up, by breakwaters and dams, the remaining mouths, so as to direct the full force of the current into the branch called Cano Coquito; or an entrance might be effected by a side cut from the Bay into one of the mouths, and the erection of guard gates at each end, by stopping the current, would prevent any deposit, or bar outside. At the distance of two miles from the mouth, the river deepened to 30 feet: and from this point to the mouth of the Truando, was no where less than 47 feet, with an average width of 350 yards. It was then proposed to follow the Truando for 36 miles, deepening and widening its channel, where required, to a point named Townsend's Junction. Up to this point, the works required would be very simple, as the banks were principally levels, formed of sedimentary deposit, and the soil of the bed of the river was of the same character. From Townsend's Junction, an open cut was contemplated for a distance of thirteen miles. It was then proposed to tunnel through the base of the ridge, a length of 3¼ miles. A double tunnel was recommended, as the width (200 feet), would require a single arch of too great a height: the division into two arches, would also have the advantage of precluding any possibility of collision. The height proposed (120 feet), would be sufficient to allow of the passage of the largest vessels, by merely lowering their top-masts. From the tunnel to the Pacific, a distance of eight miles, the canal would follow the valley of a small stream, and debouch into Kelley's Inlet.

The line would thus uninterruptedly proceed, without locks, direct south, from the Bay of Candelaria to the Junction of the Atrato, 7° 15′ N. Lat. and 77° 8′ 32″ W. Long.—a distance of 67 miles, 1,436 yards, whence it would diverge by the Truando to the south west, and terminate at the Peninsula of Paracuchichi or Kelley's Inlet, 6° 57′ 32″ N. Lat. and 78° W. Long.—a distance of 63 miles 1,216 yards. It would thus have a total length of 131 miles, 892 yards, with a minimum width and depth throughout of 200 feet and 30 feet, respectively. The most important point to be considered, was the rate and direction of the flow of water, from the junction of the Truando with the Atrato, and the supply which might be depended on at that point. It had been ascertained by Colonel Totton, the engineer of the Panama Railway, that the mean level of the two oceans, was very nearly, if not entirely, similar. The difference in the height of the tides at the two extremities of the proposed route was found to be, at the entrance of the new river in the Pacific, 12 feet 6 inches at spring tides, and 10 feet 11 inches at neap tides, while the tidal wave of the Atlantic at the mouth of the Atrato, never exceeded 2 feet at any phase of the moon. After careful observation, Captain Kennish had fixed the height of the Junction, at 15·2 feet above the mean tidal level of the two oceans.

The junction of the Truando with the Atrato, would thus be 9 feet above the Pacific, at the highest tide, and would flow down it, with a velocity equal to that head; while, at the lowest tide, the velocity would be equal to a head of 21·45 feet. The summit being at the same height from the mean level of either ocean, and the distance being nearly equal, their average rate of current would be nearly the same—about 2¼ miles per hour. As far as theory could elucidate the tidal influence of the Pacific, it would extend to Townsend's Junction, and pass under the fresh water coming down the river, without commotion either at flood or ebb. That part of the river between Townsend's Junction and the Pacific, would be slightly agitated by the rise and fall of the tide, but the velocity of the current would be scarcely affected.

By careful calculation, it had been ascertained, that the discharge of the Atrato was 667,014,600 cubic feet per hour, and the mean discharge of the new river would be about 42,000,000 cubic feet. Now, if this were taken solely from the bed of the Atrato, it would only reduce that river one-sixteenth, and its surface level, 3¾ feet, the Atrato

being 58 feet deep at the point of junction with the Truando.

The principal advantages which give the proposed route the pre-eminence over all others, were claimed to be:—

1st. That the two oceans could be thus united, by an open channel, without locks, or any other impediment.

2ndly. That the width and depth would be sufficient to allow of the simultaneous passage, up and down, at all times, of the largest class of vessels.

3rdly. That excellent harbours existed at both ends, requiring but little improvement, and at all times, perfectly accessible.

4thly. That the route passed through a country in undisputed possession of a legal government, and among a people favourable instead of hostile to the undertaking.

A summary of the estimated cost of the canal, including the works of every kind throughout its whole length, with light-houses, piers, depots, &c., as also the executive, medical, and commissary departments, was annexed to the paper. The total, including all contingencies, was fixed at 145,407,042 dollars, or £30,000,000. In constructing the canal of a width sufficient for the passage of one ship at a time, the estimate would be reduced nearly one-half.

The vast saving in time and distance which would be effected by this canal, was then dwelt upon; from New York to San Francisco, it would be no less than 13,000 miles, and proportionately large for all the ports in the Pacific. Details were given of the rapid development of trade, which was annually increasing between Great Britain, France, and the United States—and the Pacific; and also an approximate calculation of the commercial value of the canal.

In conclusion, the author repeated, that the plan developed was, perhaps, not the only practicable one—that although the information contained in the paper had been obtained, by sending to the Isthmus four different corps of engineers, fully provided with instruments for levelling and surveying, and they had made complete plans and sections of the route—yet that a more extended survey might suggest the superiority of selecting some other affluent of the Atrato, and some other terminus on the Pacific. His principal object had been, to show the practicability of communication between the two oceans by the valley of the Atrato, and that it possessed peculiar advantages for rendering that communication as large and open as the present wants of commerce imperatively required. If such was the case, he thought, that it was worthy of an official survey and thorough examination, by the governments of the great commercial nations of the world.

ON PHOTO-GALVANOGRAPHY;

OR, ENGRAVING BY LIGHT AND ELECTRICITY.

Herr Paul Pretsch, late Manager of the Imperial Printing Office, Vienna, has invented, and is now perfecting, a very remarkable method of engraving, by the combined processes of photography and electricity. The following description of his invention is from a lecture delivered by him, on the 23rd ult., at the Society of Arts:

My invention consists in adapting the photographic process to the purpose of obtaining a raised or sunk design on a glass or other suitable plate covered with glutinous substances, mixed with photographic materials, which design can then be copied by the electrotype process, so as to procure plates suitable for printing purposes. The operator first coats a glass plate with a gelatinous or glutinous solution, suitably prepared with chemical ingredients, sensitive to light, as follows:—One part of clear glue is soaked in about 10 parts of distilled water, but the quantity of water depends upon the strength of the glue and the state of the atmosphere Meanwhile, there are prepared three different solutions, viz., a very strong solution of bichromate of potass, a solution of nitrate of silver, and a weak solution of iodide of potassium. The glue is dissolved by heat, and a small quantity of it is added to each of the two solutions of silver and iodide. The remaining greater portion of the glue is kept warm, the solution of bichromate of potass added, and well mixed. After which the small portion of the glue with silver is added, and also mixed well, and allowed about ten minutes time for combining. Finally, the small portion of the glue with the iodide is added, the whole mixture strained, and it is then ready to be poured on the plates of glass or other suitable material. When dry, the coated plate is ready for exposure. The photographic picture, the drawing, print, or other subject to be copied, being laid on the prepared coated surface, they are to be placed together in a photographic copying frame, and exposed to the influence of the light. After a sufficient exposure, which is exceedingly variable, according to the intensity of the light, the plate is taken out from the copying frame, when it will be found to exhibit a faint picture on the smooth surface of the sensitive coating. It is then washed with water, or a solution of borax, or of carbonate of soda, as may be necessary. The whole image comes out in relief with

all its details, and, when properly done, with all its brilliancy.

If the original is a photograph, chalk, sepia, or Indian ink drawing, the copy represents the different tints in grains; if in lines, the copy will reproduce the lines.

When sufficiently developed, it must be washed with spirits of wine. The surplus moisture is removed, and the plate is covered with a mixture of copal varnish diluted with spirits of turpentine. After some time, the superfluous varnish must be removed by oil of turpentine, and the plate treated again, or immersed in a very weak solution of tannin or other astringent liquid. During this part of the process the plate must be carefully watched and removed as soon as the picture or design is considered sufficiently raised; it is then washed in water and dried. In this state the plate is ready to be copied. This may be effected by the customary methods of rendering the coating conducting, and placing it in the electrotype apparatus, producing an intaglio copper-plate; or, if first moulded, the intaglio mould furnishes the means of obtaining a relievo plate by electro-deposition in a similar way. To produce a *sunk* design on the prepared plates, I proceed as before, but after washing with the spirits of wine the plate must be dried on a warm place, and in due time the picture or design will appear sunk like an engraved plate. The printing plates are produced as before described.

If an intaglio plate is made, it may be printed from at the common copperplate printing press; on the other hand, the relievo plate may either serve as the matrix for producing an intaglio printing plate, or it may be itself employed in "surface" printing, like a wood-cut. In the latter case, the narrow lines of the impression being sufficiently raised, the broad white spaces must be cut out on the printing-plate, or built up in the matrix. The common, well-known stereotype process also affords another means of producing the necessary plate.

It is well known to practical men that any impression made by fatty ink can be transferred on stone or zinc, for the purpose of printing from it in a chemical way. This method can be also used in the present process, and there are some hopes of obtaining a good impression from the first glass plate, which can be transferred and printed.

After the delivery of the lecture, Mr. Roger Fenton, the recent Hon. Secretary of the Photographic Society, spoke very highly of the merits of the invention, and the progress made in the development of it during his absence in the Crimea.

ON OSMODIC FORCE.

ESSAY IN REFERENCE TO PROFESSOR GRAHAM'S PAPER ON THE "OSMODIC FORCE" IN THE "PHILOSOPHICAL TRANSACTIONS," 1853.

BY HORATIO PRATER, ESQ.

HAVING just read a good commentary on this paper contained in the *Atheneo Italiano*, for July, 1854, I propose in the present place to make some extracts from the same, and also to add some of my own opinions.

Graham concludes from his experiments, that both acids, alkalies, and also some neutral salts, &c., produce a *chemical* action on the septum, and that such chemical action is the real cause of the motion. "Thus," says he, "when the septum is made to consist of leather, gypsum, or cakes of charcoal powder, no motion takes place in the fluid, because no chemical action can take on septa composed of such materials." He continues, "the action of muriate of soda is only about 2; whereas that of carbonate of potass is 439,"* and judging from this and one or two other cases, we might at first sight be inclined to adopt Graham's opinion; particularly when we find muriatic acid 92 and oxalic acid 148, which, judging from a paper Dutrochet (the discoverer of the action) many years back, wrote on this subject, is probably rather under, than over-rated.

But, unfortunately for Graham's opinion, we find by his own experiments, that phosphate of soda is 311, and muriate of aluminum, is as high as 540! But in these cases, a chemical action, strictly so called, cannot take place; though perhaps in the latter a degree of *constriction* is produced in the membrane by *astringency*, but which, by the way, should rather, *à priori*, have been considered as *unfavourable* to the motion.

Admitting, therefore, the possibility of chemical action *increasing* the power of motion on some occasions, inasmuch as it certainly, sometimes, makes the atoms of matter move more quickly, I conclude that, *per se*, it is wholly inadequate to explain the effect. Graham does not appear to have mentioned the peculiar kind of motion, according to Liebig, produced by fermentation, in reference to this subject, but I apprehend the "osmodic motion" is more nearly allied to this kind of motion, than it is to that of chemical affinity. And this opinion is further supported by the fact, that, when the septum consists of the unalterable, *or nearly so*, materials already

* He found when these solutions were mixed in equal proportions, the former almost entirely destroyed the action of the latter! (Op. cit. p. 45.)

mentioned [viz., leather, &c.], no motion takes place. That the septum much *increases* this "diffusive motion," there can be no doubt; although the instances quoted by the *Atheneo*, from the experiments of Dorobeiner, Magnus, Baumgartner, and Graham's previous researches on "*gaseous* diffusion," show that as there is motion in these cases *without septa*, it should probably be referred, even to a still more general principle than that of fermentation. But still, as when an alkali or an acid is used, direct chemical action is produced on the septum, and when muriate of aluminum, probably an *astringent* effect, all this is in favour of the septum—sometimes in one way and sometimes in another—communicating the motion imparted to it by chemical action, astringency, &c., to the fluid; and in this respect does such motion seem to resemble most closely the motion in fermentation, in which the solid matter of yeast imparts the motion going on in itself to the surrounding fluid. But here the analogy ends; for mere motion and not decomposing motion, is imparted to the fluids in "Endosmose."

This reflection shows the necessity of resorting, for explanation, to some still more general power of motion in nature. This Fusinieri did some years back, when he experimented as to the cause of the gradual *rise* of the saline film which attaches itself to the sides of the vessel, in which certain saline solutions are left to evaporate spontaneously. He said this, and other facts, and among them "Endosmose" proved the existence in the atoms of matter of an "*expansive* power;" and the writer in the *Atheneo* adopts this view, and in one place —perhaps unintentionally—lets drop the expression, "spontaneous motion." This, however, is going probably as much too far in what *some* of our Fellows of the Royal Society would no doubt, though incorrectly, call the irreligious direction, as the expression of Fusinieri does on the opposite side; for every person must see that he really means thereby "inherent activity" —a term used many years back by the present writer in the *Mechanics' Magazine.* I adopted this for the title of a long Essay on the particular phenomena which appeared to be explicable *only* on the supposition of such being a property of the *atoms* of matter, just as the *vis inertiæ* is of masses. "*Expansive* power," has also, I apprehend, the inconvenience of not *exactly* expressing Fusinieri's real meaning; for surely he could not have conceived the *atoms themselves* to expand? but only the void or space between them. Hence he should have called it "active" power, but not "spontaneous power," as the writer in the *Atheneo* once does, since these powers are *not necessarily* the same. The human intellect seems incapable of arriving at *exact* truth on this point; and it is certainly the business of a philosopher to shock the prejudices (if I may so call them) of the saintly part of the community as little as can *consistently be done*, without injury to the great object not only of his search, but of his actual existence—viz., truth. In consequence, while I decidedly adopt the term "inherent activity" on this occasion, I maintain there is nothing irreligious in the expression, though such is, as appears to me, the false state of "religious feeling" in this respect among us, that such a term would, by the Royal and other scientific societies, be, I doubt not, almost unanimously voted highly profane, or, at least, censurable.

SURPLUS FROM PATENT OFFICE FEES.

The committee appointed by the council to consider and report on the letter of Sir Joseph Paxton, met on Thursday, the 17th ult., at the Society's house, Sir Joseph Paxton, M.P., in the chair.

The secretary read a report from the sub-committee, appointed at the previous meeting of the committee of the Society of Arts,* "to consider the details requisite to be carried out for placing the Patent Office in a state of efficiency."

The sub-committee, considering the great difficulties which would attend any proposal to alter the existing law of patents for inventions, have confined their attention to such suggestions for the further improvement of the patent system as may be carried out without the necessity of fresh legislation. Acting under this consideration, they recommend that the following suggestions should be adopted:—

1. That the whole revenue derived from the fees paid for letters-patent should be appropriated to such purposes as will promote the beneficial operation and improvement of the patent system, and encourage and aid the progress of invention.

2. That proper and suitable buildings should be provided for the offices of the commissioners of patents.

3. That the printing of all the specifications filed previously to 1852 be completed as soon as possible; and that, where it is advisable, they should be classified in regular series.

4. That the library which has been opened for the use of the public in connection with the specifications and indexes,

* See *Mechanics' Magazine* for Feb. 16, 1856, No. 1697, p. 1 9.

under the Act of 1852, be further extended, and that better accommodation be provided for those who visit it for the purposes of consultation.

5. That the system adopted by the Commissioners of presenting copies of their publications to all free libraries in this country, and of interchanging them for the official publications of foreign countries, be carried out on a most liberal scale.

6. That the system of indexing and classifying, found so efficient in the case of English patents, be applied as far as possible to the foreign publications relative to foreign patents which have been, or hereafter may be, procured by the Patent Office, so as to afford the English inventor every facility for obtaining information respecting foreign inventions.

7. That a judiciously selected series of models be collected, and arranged so as to mark and illustrate the progress of invention in the leading branches of art and manufacture.

8. That the system of registering proprietors of letters patent as now adopted in the Patent Office, be rendered more simple.

The committee resolved that the report be received and adopted, and also that a memorial be addressed to the commissioners embodying the report; that it be laid before the council of the Society of Arts; and that the council be requested to communicate with the commissioners, and ascertain when they will receive a deputation with the memorial.

LOMAX'S IMPROVEMENTS IN STEAM ENGINES.

Mr. W. Rothwell Lomax, of Hammersmith, has patented the following improvements in steam engines. In order to use the steam advantageously an expansion valve is employed, which has a seat formed in the following manner: there are two openings with passages which conduct the steam to the ordinary valve box, and, in addition to these openings on the face of the seat of the valve, there are two recesses which extend to a greater radius than the opening, and are so formed that when the two hollow parts of the rotating valve, which are of the form of the openings through the seat, partly cover the recesses in the seat, and also the openings (which lead to the ordinary valve box) steam will pass from the expansion valve to the ordinary valve box; but when the hollows or recesses in the rotating valve only cover the opening through the seat, no steam will pass from the expansion valve to the engine. The rotatory valve receives motion from the engine by a strap or band. Although the valve is described as having *two* recesses, and the seat as having *two* openings through it, this may be varied; in one revolution of the expansion valve the steam may be admitted and cut off more than once.

In order to govern and regulate the admission of steam from the boiler to the engine, the patentee employs one fixed crank or arm on the shaft, and another crank or arm which is moveable, on the shaft, and a spring or springs are interposed between the moveable and fixed arms or cranks, so that the driving will be through the spring or springs. On the boss of the moveable arm are a series of inclines which correspond with a series of inclines on a sliding collar on the shaft, which collar is constantly pressed towards the boss by a spring or springs. The collar acts on the end of a lever which acts on the throttle valve; hence, when an excess of steam passes to the engine, the lever is acted on by the collar; or, in place thereof, the two sets of inclines may be on an axis, and acted on by the vibration of a pendulum, or by an apparatus acting in a similar manner to a pendulum; and when the driving is through a secondary axis, then the first and second axes are geared together by two spur or cog wheels, and the end of the second axis is carried by a lever, so that the end of it may rise and fall; one end of the lever is carried and moved on the main shaft or axis of the engine, the other end of the lever gives motion to the throttle valve, and is resisted by a spring or springs.

BIDDELL'S IMPROVEMENTS IN RAILWAY CROSSINGS.

Mr. G. A. Biddell, of Ipswich, has recently introduced certain improvements which relate to those parts of the wing rails of crossings which are subject to the greatest wear, and consist in manufacturing them of cast-iron, so that the parts subject to wear from the action of the carriage wheels shall be very hard, this hardness being produced either by using hard white iron, or by the ordinary method of chilling cast-iron, which is the plan preferred. If hard white metal is in part used in the manufacture of these crossings, whether with or without the method for "chilling," it should be used in the following manner; viz., the surface of the wing rails upon which the wheels are intended to run should form the lower portion of the mould so as to receive the hard white metal which must be the first portion poured in, and immediately afterwards the ordinary metal must be poured in, so as to form a perfect union of

the two kinds of metal. The object of thus using two different kinds of cast-iron are to ensure a hard wearing surface, and to obtain greater strength with the same quantity of iron. Mr. Biddell's improvements also consist in making the bent portion of the wing rails, and a considerable portion of the point rails, as nearly as practicable one compact and solid mass of iron, so that their relative positions are unalterable when once manufactured, and secure against the casualties which so frequently happen from the effects of ignorance, carelessness, or neglect. Another advantage consists in the facility offered in laying down crossings of this kind, as none of the ordinary rails forming the permanent way upon which the wheels run require to be bent or cut.

DURANT'S REGISTERING APPARATUS FOR PUBLIC CARRIAGES.

A. Durant, Esq., of Tong Castle, Salop, has recently patented in this country an invention which consists of an apparatus to be called a "Monitor," for indicating the number of passengers entering a public carriage. For this purpose motion is communicated to a pointer from a moveable step, on a passenger entering a carriage; the pointer is acted on by a spiral spring tending to force it outwards, so that when it has made one revolution in a circular groove on the dial, it is by the spring forced outwards and caused to enter another circular groove, around which it passes, step by step, as passengers enter, or distances are told, till the pointer arrives at the end of the second groove, when it is again forced outwards and enters a third groove.

In order to ascertain more particularly how far passengers in cabs, or such like carriages have travelled, the seats are hinged, and by springs and levers, are held up, by which means the counting instruments are kept out of action so long as there are no passengers, but so soon as the seats are depressed by passengers sitting thereon, the measuring and counting of distance proceeds, and is recorded by the dial; and in order that the time also may be indicated, a time-keeper and a second hand on a similar principle are combined with the apparatus on the same dial if necessary.

IMPROVEMENTS IN CUTTING STONE.

M. Eugéne Chevallier has recently introduced a method of combining mechanical parts into a machine, in such manner that quick motion may be given to a wire, and be the means, when aided by a constant supply of sand or grit and water, of cutting stone. The wire, by the arrangement of the machinery, is caused to enter further and further into the stone, according as the cut into the stone is accomplished. For this purpose an endless wire, of soft iron by preference, is placed on two grooved pulleys which are at a distance apart. One of the grooved pulleys is driven or caused to rotate by any suitable power, by which a quick motion is communicated by a band of wire, which is kept distended by a weighted pulley acting on a part of the endless band of wire, at a distance from where the cut is being made by another part of the endless wire. The stone to be cut (when the cut is to pass completely through it) is placed on a suitable bed or stand so as to be supported above the level of the floor between the two pulleys or wheels which carry and give motion to the endless wire. The endless band of wire is not held in straight lines between the peripheries of the two pulleys or wheels, being too long to do so. Hence, as the cut is made into the stone, that part of the wire which is for the time being making the cut may at starting be considerably out of the straight line, whilst the part passed on to give the tension may be more nearly in a straight line, and may be more and more pressed into a curved line as the cut is made more and more deep into the stone. Each machine may be made with one or more cutting wires.

This method of cutting stone has very recently been patented in this country for the inventor, by Mr. Charles Manby, Secretary to the Institution of Civil Engineers.

MARCHINTON'S IMPROVEMENTS IN VICES.

Mr. J. M. Marchinton, of Bruce Works, Sheffield, has recently patented certain adjustable vices of a simple and economical form, whereby the jaws of the vice may be adjusted to grip tapered objects, and also to take in a greater variety of sizes of objects than the ordinary existing vices. The jaws are opened or closed by a screw in the ordinary manner; but, according to one modification, the front jaw is hinged at the lower end of its shank to a joint piece, which is also hinged so as to turn horizontally on a vertical joint pin, passed through a projecting lug in the main stem or shank of the back or fixed jaw. By these means the front jaw can be turned and be adjusted to tapered objects so as to grip them more firmly than can be effected by vices of the ordinary construction. The upper portion

of the shank of the back jaw is embraced by a collar fixed to the work-bench; it is made octagonal or polygonal at the part where it passes through the collar, and is tightened or fixed in any desired position, according to the object to be gripped, by means of a key passed through the collar.

In another modification, the shank of the front jaw is hinged to a joint-piece, which is also hinged to turn horizontally on the end of a square sliding bar, passing through the stem of the back jaw, in place of being hinged to a lug in the stem itself, as in the former arrangement. By this latter arrangement the front jaw may be slid in or out by simply adjusting the square sliding bar, which is effected by means of a small lever handle and a link, which is jointed at one end to the handle, and at its other end to the sliding bar.

Helical springs are in all cases substituted by Mr. Marchinton for the ordinary blade springs, the helical springs being made to expand vertically, and press against a projecting lip or flange on the inner side of the shank of the front jaw, whilst their lower ends rest upon the hinged joint-piece before described.

BOBBIN NET OR TWIST LACE MACHINES.

Mr. F. Rainford Ensor, of the Park, Nottingham, has recently improved the above machines by an invention, the object of which is to admit of the use of a greater number of warp threads than is at present used. For this purpose, the front and back combs (such as have been heretofore used) are placed at a considerable distance apart, and a third comb is introduced between them, of small dimensions compared with the other combs, and simply suitable for aiding to support and guide the carriages in their passage from and to the front and back combs, and unsuitable to act as an independent comb to receive and alone support the carriages. In the space between the back and middle comb, and between the front and middle comb, the warp threads pass, the extent of such space for receiving the warp threads being considerably greater than could be obtained between the front and back combs if no intermediate comb were employed.

NOTE ON TONNAGE ADMEASUREMENT.

Owing to an accidental circumstance, the "Note on Tonnage Admeasurement" in our last week's Number did not receive a final editorial revision, in consequence of which several typographical errors remained uncorrected. That none of our readers may be thereby puzzled or misled, we subjoin the necessary corrections:

Page 392, column 1, lines 14 and 13 from bottom, *for* "ABCB" *read* "ABCD," and *for* "AECD" *read* "AECB."

Page 392, column 2, line 16 from bottom, *for* "P_1 Q_1, Q R," *read* "P_1 Q, Q R," and line 13 from bottom, *for* "Since HM," *read* "Since A_1M."

Page 393, column 1, line 5 from bottom, *for* "P*q*," *read* "*pq*."

Page 393, column 2, line 14 from top, *for* "interval *p*," *read* "interval *n*," and between the 9th and 10th lines from top introduce the line "&c. =&c."

In the 11th line on page 393, (which line extends across the page,) the middle term should be "$4(a_2+a_4+a_6+$ &c. $+\ a_{2n})$."

The sense of the text would be improved if after the letters "DE" in the last line of the 1st column, on page 393, the words "proportional to these several cubic contents" were added.

GOVERNMENTAL INSANITY!

PUTTING OUT OF THE WAY THE ART AND TRADE COLLECTIONS OF LONDON.

To the Editor of the Mechanics' Magazine.

Sir,—Truth is occasionally to be sought for at a great distance of time or space. I perceive by a late paper of New South Wales, that the legislative opposition of that province charges some acts of the British Colonial Government with the stigma of demonstrating *insanity*. That is hitting the nail in its right place. This appellation is, in my opinion, applicable to the idea—(aye, and partly carried out plan) of placing the Marlborough-House collections, the Trade collection, the Patent Museum, the Educational Museum, and the Museum of Animal Produce, in a building situate on the Kensington Gore Estate, nearly three miles from St. Paul's! I would defy the combined folly of Bedlam to engender a plan more foolish and wicked. I have been for the last nineteen years a reader at the British Museum Library, and when the world oppresses me to the very worst pitch, I go, often on a clear sunny afternoon, amongst the sculptures of the Parthenon; but I am quite convinced, that if the British Museum had been situated at Kensington, I should not have gone there nineteen times in the nineteen years. And I am not one of the poorest; neither am I a striving apprentice, like Whittington, the French potter Palissy, and other persons, who may, perhaps, once in a month contrive to get half an hour's time to go to see a collection of the kind, with a rough bit of pen-

cil and scrap of paper in their hand. It is only by closely adhering to the utterance of the younger Jonathan at the gold fields, that we can express the utter disgust such a measure must occasion, especially when such stupendous spaces as the old Fleet Prison and Smithfield Market are at hand.

I am, Sir, yours, &c.,

15, Gower-street, April 19. J. Lotsky.

MECHANICAL LOCOMOTION.*

To the Editor of the Mechanics' Magazine.

Sir,—I did hope that it would not have been necessary for me to have written again on the subject of the locomotive lever, but the very extraordinary character of the reply which your correspondent "W." has given to my last communication compels me to take some slight notice of it; not, however, for the purpose of continuing or enforcing the argument—for "W.," by ceasing to maintain his own views, and literally adopting mine, has tacitly acknowledged himself to be placed *hors de combat*—but for the purpose of rebuking the spirit and temper which he has chosen to impart to the discussion. I was prepared to expect and to excuse some little ebullition of feeling; for to a gentleman who indulges in the supercilious tone which he adopts towards practical men, it must have been very annoying to have been detected by one of that class in a blunder so gross as to be paralleled only by an Irish bull, and that too in spite of the parade of mathematical learning under which it was concealed. Still the anonymous character of your correspondent should, according to my notions of good taste, have suggested a certain degree of moderation; but it is in vain to expect good taste when even good faith is not to be found. * * * To what extent a charge of this kind can be brought against your correspondent is for your readers to say, after comparing the following quotations, being my own statements and "W's." version of them.

"I wish to press upon him the importance of the difference between mathematical conceptions in the abstract and those concrete views which practice enforces as a necessity, when dealing with the actuality of things in their ultimate issues, and when contemplated as complicated by collateral influences, &c."—B. C.

"Mr. Cheverton makes a most absurd distinction between abstract and concrete conceptions of force, which shows little but his ignorance of the mode in which mechanical problems are treated."

"Of this, however, I am thankful, that I have never drawn a distinction between abstract forces and concrete forces." —"W."

To make a distinction between abstract and concrete *forces* would indeed be absurd, for force is itself an abstract idea; nevertheless it is quite true (what only was asserted by me) that mathematicians have merely to deal with mechanical problems in the abstract, whilst practical men have to consider them in the concrete, or in that very difficult point of view in which they are invested with their mechanical appliances, their material circumstances, and their practical objects, wherein the judgment and a natural sagacity are peremptorily brought into requisition, but of which the mathematician, without any detriment to his studies, may be entirely without.

"As the three points of a lever may be simultaneously taken as the seats of as many forces, and as any one point may be taken indifferently as the centre of forces acting round it, &c."—B. C.

"However much it may appear to be a solecism to Mr. Cheverton, there are undoubtedly three forces applied to an oar, and to a lever of any kind."—"W."

However true the statement (which I myself asserted in other words) that there are three forces applied to a lever, yet in the practical forms of an abutment for a fulcrum, and of work executed, two of them are so much concealed that it is not customary in current language to speak of more than one force, and it would lead to confusion if we did. Where, then, is the absurdity which "W." discovers in my saying "that mathematical conceptions can be true theoretically (and even physically in regard to the inherent nature of force), and yet so unreal as to the outward form and manifestation [that is, having so little obvious conformity to the appearances of things], that it *sounds* like a solecism to speak of three forces in equilibrium in connection with power, fulcrum, and work." But I took care to add, "that in the region, however, of the mathematician—the region of theory and abstraction—such language is correct; for whatever opposes force *is* force"—a dictum, by-the-bye, which I inserted expressly for "W."'s benefit; for, if my memory is not greatly at fault, he has not always recognized it himself. I refer to his notions concerning centrifugal force.

"The point where the fallacy lies, is *not* in the equation determining the pressure on the row-lock, but

"Taking, therefore, the point of the oar in the water for fulcrum, the equation which he thinks so ridiculous,

* We have expunged from this letter a passage or two containing unfounded imputations which we cannot give place to.—Ed. M. M.

in assuming that such pressure is the measure of the propelling force."

"The absurdity that "W."'s statement is reduced to, arises from not taking the moments from the row-lock, as the centre where alone the relation between the power as a motive cause and its action as a useful effect can be obtained."—B. C.

gives the true relations between the power exerted by the hand and the pressure on the row-lock."

"Mr. Cheverton, however, tries to prove that this equation is wrong by a *reductio ad absurdum*."—"W."

In the whole course of my controversial reading, I never met with a bolder substitution of the false for the true, or a more unflinching attribution to another of opinions the very reverse of those which he advanced, than is exemplified in the above quotations. A very cogent motive could alone have induced your correspondent thus to act, and this is it: he perceived that he was in error, but not having the candour to acknowledge it, he endeavoured to slide sinuously from his own position into mine; but to do this it was necessary, first, to turn me out, by pretending that I had occupied another.

The state of the argument, in brief, is this:—I asserted that the row-lock must be taken as the fulcrum of the lever, meaning thereby the centre proper to the purpose, when the special object is to obtain the ratio of the power to the resistance. "W." admitted that for *this purpose* there is an appropriate centre; but, with a strange want of consideration, he assigned it to the end of the oar in the water, saying that such ratio "would be correctly obtained by considering the oar to be a lever of the second kind." He then gave an equation representing correctly enough the pressure on the row-lock, and in necessary consistency with the assumed place for the fulcrum, he conceived that pressure to be the propelling force. Now by taking an extreme case (the hand on the oar close to the row-lock), I showed that such pressure would be equal to the power applied, and yet no useful effect be produced; thus proving by the absurdity deduced that there was an error, not in the equation determining the pressure on the row-lock, as "W." would fain impute to me, but in the position he had chosen for the fulcrum. I further stated in illustration of this error, that in such extreme case the lever must still be supposed to exist, if the fulcrum was where "W." placed it; and that the effect ought to be equal to the power, whereas, in reality, the lever would then have no existence, and all action would terminate in the boat.

Now in order to confute, or rather to confound me, the plan which "W." adroitly pursues, is silently to abandon his own position in regard to the place of the fulcrum and quietly adopt mine. Having thus honestly relieved himself of the absurdity involved in the extreme case put by me, and for which, as a deduction from his own premises, he was necessarily responsible, he proceeds to give an explanation of that case on my own principles and almost in my own words, as though by right it was his, and I was ignorant of it. He even feigns to give me instruction thereon, in language almost an echo of that which for *his* benefit I had used myself; but he considerately allows that I had "*unconsciously* furnished the correct answer, by stating that the oar in that case ceases to be a lever." He then condescends to tell me, that "if Mr. Cheverton had known how to deal with considerations of this kind, he would not require to be told by me that, taking the row-lock for fulcrum and obtaining the equation $Pa = Qb$;" as though this equation and this fact of the fulcrum being at the row-lock, on which it depends, did not constitute the very proposition for which I have all along been contending in opposition to the contrary one asserted by himself! I can no longer deny ingenuity to a mathematician in at least the art of *appropriation*. I am also *instructed*, "that if the hand move up to the row-lock, the oar becomes practically part of the boat, and the pressure on the row-lock and the power exerted by the hand are internal forces," as though I had not asserted "that the lever has then no existence, and that all action is spent upon and terminates within a rigid structure;" and as though he had not afforded me occasion to remind him "that external and internal reaction are very different things." Moreover I have the felicity of being taught by this Mentor of my own creating, "that if Mr. Cheverton had any real knowledge of 'work,' he would have known that the work developed by the power being *nil*, the work done in propelling the boat is *nil* also." Astonishing! I thought, however, I had expressed the same ideas, although they did not take the form of such a truism, when I made the following remark for "W."'s own enlightenment: "We see that in a certain position of the hand of the rower the exertion of power is useless."

Thus does your correspondent graciously teach me in backward sequence CBA, in return for having taught him ABC. To speak seriously, however, and to use a phrase of his own, he well knows "in his heart of

hearts" that he *has* been in the wrong, for he is too intelligent not by this time to have perceived it; but he should have openly and honourably acknowledged his error. * * I will not, however, relax my hold upon him; he must keep to his own position or be silent; and I challenge him to maintain openly and manfully the propositions which in his own words he has thus laid down:—"I repeat, therefore, that if we could consider the oar to be acted on by invariable forces, the ratio of the *propelling force* on the row-lock to the force exerted by the rower, would be correctly obtained by considering it a lever of the second kind, as generally represented by way of illustration in mechanical books." But whether he answers my challenge — which he knows better than to do—or whether he evades it by sophistry, which he most probably will, I will hold no further controversy with a writer who falsely represents the words and opinions of his opponent in the way which your correspondent has done.

One word as to the merits of mathematical learning. "W." denies that there is "any discrepancy between sound theory and sound practice." That he may well do in regard to *sound* theory, but even then there may be an insufficiency, though not a discrepancy. But what degree of mathematical learning will guarantee a sound theory, especially from the hands of any individual mathematician? "W." says he is "not concerned to defend the errors of quasi-mathematicians;" but is he himself a quasi-mathematician? Is he not as much deserving of our confidence as any gentleman of his class who is not more than a mere mathematician? And yet what an Hibernian blunder would he have led us into, notwithstanding his display of mathematical symbols, and his being so conscious that "unless they represent physical conditions, they are naught." No one has written more earnestly than himself against "the folly of trusting in equations simply because they are equations." So there is a folly of this kind abroad? No doubt of it, and to a greater extent than will be credited except by the more profound mathematicians themselves; but, in general, they stand by their order, and do not proclaim it. I am now more than ever convinced that "W." is a consummate mathematician, or he would not have attained to this state of sagacious humility. It is the neophytes, then, who conceit the all-sufficiency of themselves and their science, for theory or for practice. It is the quasi-mathematician, after all, who is so infallible. "W." throws contempt on the *penchant* for theory of some practical men; he may do so with all my heart. It is not their province; in general they get beyond their depth, and should leave it alone. It is seldom, however, that the real practical man attempts this *rôle;* but if he have legitimate pretensions to undertake it, no man is so likely to excel: of this Newton himself was an illustrious example. The mental qualifications for excellence in either pursuit are, however, so diverse, that in general one predominates so entirely as either to expel or spoil the other. To harmonize and be in useful accord they must be in equilibrium, which is as hard a condition as that of serving two masters; and the attempt to maintain a divided allegiance to two such exacting task-masters as theory and practice, will in most cases result either in a neglect of duty to the one or an imperfect and slovenly service to both. The principle of the division of labour will be as usefully carried out here as in other departments of knowledge. Of course I do not refer to the exclusion of those subordinate branches of mathematical learning which are mere matter of educational routine.

I am, Sir, yours, &c.,

BENJ. CHEVERTON.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

HILL, D. *Preparing a material capable of resisting fire, and especially suitable for the interior of puddling and other furnaces.* Patent dated September 15, 1855. (No. 2085.)

This invention consists in combining and melting limestone with ironstone, or with the cinder from puddling furnaces, or from ball mill furnaces, and in running the same in moulds or otherwise.

SANGSTER, W. *An improvement in the manufacture of stays and corsets.* Patent dated September 15, 1855. (No. 2086.)

Heretofore in the making of stays and corsets the fabrics used have been those woven by warp and weft, and wherein the warp and weft are at right angles to each other. This invention consists in applying warp fabrics of those descriptions where the warp threads are not only looped into each other, but are also traversed from selvage to selvage, by which the fabric so made is elastic in all directions.

ZENNER, D. *Improvements in washing and separating pulverized ores and matters.* (A communication.) Patent dated September 15, 1855. (No. 2088.)

The invention consists of a table moving or rotating on its own axis, and the surface of which inclines inwards from the circumference. The ores or matters held in sus-

pension in water are allowed to fall on the table, at or near the centre, whence they are carried by the force of the current towards the outer edge, and during the passage are kept in agitation, and are delivered by means of certain brushes, or other similar appliances, into a number of receptacles in the order of the different sizes of the grains, or the specific gravity of the component parts.

GORDON, L. D. B. *An improvement in electric telegraphs when insulated wires are laid under water or in the earth.* (A communication.) Patent dated September 15, 1855. (No. 2089.)

This invention consists chiefly in using two insulated wires, placed close to each other, and imbedded in insulating material, as one electric circuit in which the battery and receiving instrument are inserted without using the earth as part of the circuit. The two conducting wires will be charged equally at any given point—the one with positive and the other with negative electricity; and since both are in equal proximity to the surrounding water or earth, no electric charge can take place between the wires and the earth; nor will any induced current be produced in additional conducting wires that are imbedded in the same conducting mass, provided they are placed equidistant from two wires forming the electric circuit. The same cable may therefore contain one or more sets of insulated wires close to each other, which may be used simultaneously as circuits without the interference of one with the other.

FORD, A. *Improvements in preparing solutions of caoutchouc, gutta percha, and like gums for waterproofing and other useful purposes.* Patent dated September 15, 1855. (No. 2090.)

These improvements consist in dissolving India-rubber, gutta percha, and like gums or combinations thereof, in oil, or turpentine, or naphtha, peculiarly heated for that purpose, and in applying such solutions as a cement, varnish, paint, or waterproofing agent, or simply to soften substances for general purposes. The solvent is prepared by subjecting oil of turpentine or naphtha to the action of a caustic alkali or alkalies, or alkaline earth or earths, separately or combined in a suitable vessel, occasionally agitating them for the space of about three days, and then allowing time for the subsidence of the resulting deposit. The supernatant pale fluid is then to be drawn off from the dark-coloured deposit, and, if desired, filtered.

LEWTAS, J. *Improvements in apparatus for holding and letting go cords, chains, or bands.* Patent dated September 17, 1855. (No. 2092.)

This invention consists of a combination of a travelling roller or block, having its ends or the ends of its axle mounted and working in slots slightly curved at their lower ends, and a fixed plane or surface towards or from which the roller or block, moving with its ends or the ends of its axle along the slots, may as required be caused to approach or recede, for the purpose of pressing against and holding a cord, chain, or band, or for the purpose of releasing it.

GIBBS, E. *A new or improved manufacture of picture-frames, vases, busts, and such articles as are or may be produced by the process of moulding.* Patent dated September 17, 1855. (No. 2095.)

This invention consists in the manufacture of such articles as may be produced by moulding, from the asphaltum or pitch obtained as a residual product in the distillation of gas tar for the manufacture of coal naphtha. In order to increase the hardness of the pitch, charcoal or brick-dust in fine powder is mixed with it, the proportions preferred being four parts of pitch to one part of charcoal or brick-dust.

BROOMAN, R. A. *Improvements in obtaining raw silk, which are also applicable to fibres worked in a wet state.* (A communication.) Patent dated September 17, 1855. (No. 2102.)

This invention consists in neutralising the sticky effect of the gum or gummy matter produced in the winding of silk from the cocoon in a wet or damp state, and in the working of other fibres, such as flax, in a wet or damp state. When applied to the cocoon, the fibres can be directly wound upon bobbins, winders, or other carriers, without causing adhesion between them, or between one layer and another; and the substances which are employed for the purposes of this invention are alcohol essences, carburets of hydrogen, neutral fatty matters, oils, and glycerine and oils mixed with ox-gall, emulsions of oils, water and ox-gall, or a mixture of oils or fats with the substances before mentioned.

BRIGHT, C. T., and E. B. BRIGHT. *Improvements in electric telegraphs, and in apparatus connected therewith.* Patent dated September 17, 1855. (No. 2103.)

This invention consists of improvements in the electric telegraph complete; that is to say, in communicating the power and connecting the conductors as a medium, and in means whereby the power transmitted is made to manifest improved results. It comprises the employment of a system of telegraphing in which the signals are demonstrated by sound instead of by visual indications, of arrangements for connecting telegraphic apparatus whereby increased effects may be obtained from the sending part

of the instruments and from the conductors; and in means of increasing the sensitiveness of the receiving apparatus or relays, and protecting them from the effect of return currents. The principle upon which the apparatus for producing sound is constructed consists in causing a secondary current to operate upon a magnet or armature directly actuating the hammer of a bell or other means of producing sound by the movement of an indicator or relay in the primary or line circuit.

BROOMAN, R. A. *Improvements in knitting machinery.* (A communication.) Patent dated September 18, 1855. (No. 2106.)

This invention relates to certain improvements in the knitting frame, which have for their object the making of both kinds of fabric known as plain and ribbed work, by a machine operating as a power-loom.

SMITH, F. H. *An improved break for carriages with poles.* Patent dated September 18, 1855. (No. 2108.)

This invention consists in working a brake by the action of the horses when being stopped or pulled up. A lever is fitted to the end of the pole, which is connected at one end to the pole chains or straps attached to the collars of the horses, and at the other end has connected to it a rod, which extends behind the front or back wheels, and carries a brake bar to which two shoes are fitted. On the pole chains being drawn back, the brake rod bar and brakes are drawn forward, and arrest the progress of the wheels. A spring is provided which is sufficiently powerful to release or pull back the brake bar and brakes as soon as the pole chain is slackened.

NEWTON, A. V. *An improved construction of paddle-wheels, and an improved mode of mounting such wheels.* (A communication.) Patent dated September 18, 1855. (No. 2109.)

This invention consists—1. In making the face of the paddles concave in order to concentrate to a focus the force upon the water when the wheel is used for propelling forward, and at the same time preserving the plane upon the back of the paddle to prevent the slip arising from paddles with a concave face and convex back. 2. In a mode of mounting the wheels that will permit the number of paddles in the water being so alternated as sensibly to relieve the shock upon the engine.

WARREN, W. *Improvements in the construction of vices.* Patent dated September 18, 1855. (No. 2110.)

In the improved vice there is a fixed jaw and a moveable one, the first being fixed to the bench; a guide bar is connected with the moveable jaw, which passes through a groove or slot in the fixed jaw, and is made hollow, and in its motion slides over a screw box fixed in the bed plate, the bed plate being made in one piece with the fixed jaw. The motion of the moveable jaw is produced by a screw, situated nearly in the axis of the hollow guide before referred to. When the screw is turned, it advances in or retires from the screw box, and the shoulder bearing against the moveable jaw, brings it towards the fixed jaw.

WILLIS, J. *Improvements in the construction of umbrella and parasol furniture.* Patent dated September 18, 1855. (No. 2111.)

In forming that part of top notches or runners in which the inner ends of the ribs or stretchers are respectively inserted, tube or strips of metal are used bent up into the form of a trough or unclosed tube, and formed into rings, and then fixed on the body of the top notch or runner. The necessary openings are afterwards made for the ends of the ribs or stretchers, and an annular opening (when such is required) for the attaching wire or ring. In place of using hollow metal rings for the bearing of the ribs and stretchers, the patentee also uses solid rods formed into rings, and fixed as before. In place of the ordinary twisted wire for attaching the ribs and stretchers to top notches and runners, the patentee uses rings of steel or other metal.

CORNIDES, L. *Certain improvements in obtaining impressions of prints or drawings and in transferring, printing, and colouring, or ornamenting the same on glass or other surfaces.* Patent dated September 19, 1855. (No. 2112.)

Claims—1. A peculiar mode of transferring impressions to the gelatined surface of glass in water, by which the impression is rapidly and evenly spread over the surface. 2. A process of transferring negative impressions to the gelatined surface, so as to produce a positive effect or picture by the light seen through such negative impression. 3. A process of sifting fine glass powder on the transferred impression, so as to heighten the effect of, or colour the same. 4. The use of the gelatined glass surface for the purpose of making photographic impressions, as described. 5. The heightening the effect of the transferred impression, or colouring the same, by powdering the impression as described, and then transferring the same so produced to the gelatined surface.

BIDDELL, G. A. *Improvements in railway crossings.* Patent dated September 19, 1855. (No. 2113.)

A description of this invention is given on page 418 of this number.

COULSON, S. *An improvement in the manufacture of ornamental metal tea-pots, coffee-*

pots, milk-jugs, and sugar-basins. Patent dated September 19, 1855. (No. 2114.)

This invention has for its object the manufacture of metal tea-pots, &c., with raised ornaments thereon. and plating and gilding the same, and the improvement consists in preparing the sheet metal used with raised ornaments thereon by pressure. The desired devices are engraved or sunk in rollers or other surfaces, and then by pressure are produced in relief on the sheet metal; such ornamental surfaces, when of inferior metal, can then be gilt or silvered by deposition.

LOMAX, W. R. *Improvements in steam-engines.* Patent dated September 19, 1855. (No. 2115.)

A description of this invention is given on page 418 of this number.

BROOMAN, R. A. *Improvements in preserving animal and vegetable substances.* (A communication.) Patent dated September 19, 1855. (No. 2116.)

This invention consists in treating such substances in the following manner. They are first deprived of blood serosity and superfluous natural humidity, and then subjected to the action of sulphuric acid gas in an air-tight vessel, being suspended so that the separate pieces may not come in contact with each other, nor with the vessel. After exposing them to the air they are coated with a thin layer of a composition consisting of animal albumen with a decoction of mallows root with a small quantity of syrup of molasses.

LINSEY, J. H. *Certain improvements in account books and other large books.* Patent dated September 19, 1855. (No. 2117.)

This invention consists—1. In making the backs of books of one solid piece of steel, so as to act as a spring to give it elasticity, and to preserve its shape. 2. In combining mill-boards with the steel back to prevent the metal from cutting the material with which the back is covered. 3. In the use of longitudinal pieces of metal hinged to the covers, and acting as levers to assist in throwing the book open, and keeping the leaves flat when the book is open. 4. In covering the outside of the metal back with linen, or other similar material, and securely fastening the same between the mill-boards of which the cover is made, previous to placing the outer or finishing cover over the back and cover of the book.

PAGE, J. *Improvements in moulding or shaping metals.* Patent dated September 20, 1855. (No. 2119.)

This invention mainly consists in a mode of forming moulds for casting in metal articles of various shapes, and particularly hollow ware, shells, and shot, by first partially ramming, then cutting or scooping out portions of the mould material (or otherwise preparing the mould with a thickness of mould material occupying a somewhat greater space than in the finished mould), and then compressing or condensing the mould material, and bringing it to its finished condition and dimensions by forcing a suitable pattern into the mould.

PALMER, J. *Improvements in the construction of reaping-machines.* Patent dated September 20, 1855. (No. 2120.)

The inventor proposes—1. A novel construction of radial roller platform, which is intended to receive the agricultural produce as it is cut, and facilitate its discharge on to the ground. 2. For the purpose of gaining strength without increasing the weight of the implement, the separator which divides the corn to be cut from that which the machine is to pass is made of steel, and the side plate or fence of the platform of galvanized iron, which will resist the effects of damp and moisture.

LEES, A., and J. CLEGG. *Certain improvements in looms for weaving.* Patent dated September 21, 1855. (No. 2121.)

Claims.—1. The combination of a chain of tappets and a tappet-wheel for changing the position of the drop-box. 2. Causing the tappet-wheel to revolve first in one direction, and then in the other, for the purpose of producing the requisite number of changes in the position of the drop-box. 3. The combination of a chain of tappets and tappet-plates for changing the position of the drop-box. 4. A mode of combining the intermittent pieces and tappet-wheels when used for changing the position of the drop-box.

DALE, J. *Certain improvements in appropriating waste products arising in the manufacture of certain chemical compounds.* Patent dated September 21, 1855. (No. 2122.)

Claim.—The use of the evolved compounds of nitrogen with oxygen arising in the manufacture of arsenic acid, picric acid, oxalic acid, or salts of iron or copper, by nitric acid for the oxydisation of proto salts of tin or iron, or for the production of nitrates, such evolved gas or gases having heretofore been a waste product.

PARKINSON, G. S. *Improvements in railway breaks.* Patent dated September 21, 1855. (No. 2123.)

This invention consists in placing a fixed and a moveable "clutch" on one of the axles of a railway carriage, and attaching to the collar of the moveable clutch a chain or lever, so as to work the jambs or shoes which break the wheels. The moveable clutch is put in or out of gear by a long rod working other rods, and terminating with

couplings at the ends of the carriage. The clutch on the guard's carriage is brought into action by a nearly similar arrangement, and when in gear by means of the chains or rods connected with it, it draws the long rods under all the carriages in the train, and thus brings the whole series of jambs into simultaneous action. This invention can be applied either as a single or continuous brake.

Brasseur, U. J. *Improvements in machinery for winding weft.* (A communication.) Patent dated September 21, 1855. (No. 2124.)

This invention consists in an arrangement of machinery by which numerous yarns of weft may be wound at the same time, and by which also the length of yarns wound may be measured, the machine stopped, and notice given by a bell when the desired quantity has been wound.

Pollitt, W., and J. Eastwood. *Improvements in apparatus for churning milk and mixing liquid compounds.* Patent dated September 22, 1855. (No. 2125.)

This invention consists in using a vessel placed on a driving shaft supported by suitable bearings. On the shaft are fixed one or more bevel or spur wheels, which work in others fixed outside the vessel, but at the extremity of shafts or spindles placed inside the vessel. On each of these shafts are fixed frames with beaters, so that as the driving shaft is turned, the shafts and beaters inside the vessel revolve in opposite directions, thus giving a compound action to the beaters, and an agitated motion to the milk or liquid.

Chalmers, D. *Improvements in the machinery or apparatus for cutting the pile of woven fabrics.* Patent dated September 24, 1855. (No. 2127.)

This invention consists of an improved construction of cutter or cutters of a circular form, with any convenient number of indentations or pieces cut from their peripheries, in order to form cutting edges. The edges are inverted, or close to the flat or blunt rim of the circumference of the cutter. The necessity of separate guides is thus dispensed with, the form of the cutter itself constituting a guide, following that part which cuts and keeps it in the race of the material.

Beattie, J. *Improvements in furnaces and boilers for the generation of steam, and in apparatus for the application and treatment thereof.* Patent dated September 24, 1855. (No. 2129.)

A description of this invention will be given hereafter.

Marchinton, J. M. *Improvements in the construction of vices.* Patent dated September 24, 1855. (No. 2130.)

A description of this invention is given on page 419 of this number.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Scully, V., and B. J. Heywood. *An improvement in the manufacture of certain articles which are subject to the corroding action of the air and moisture.* Application dated September 15, 1855. (No. 2084.)

It is proposed to introduce into the manufacture of wind and stringed musical instruments the use of aluminium, which, by reason of its non-affinity to oxygen, and its lightness and ductility, may be employed in place of brass, copper, and silver. It is also proposed to manufacture therefrom pens, penholders, and inkstands, upon which the ink will have no appreciable chemical action.

Hamilton, G. *Improvements in apparatus for weighing.* Application dated September 15, 1855. (No. 2087.)

A wheel or disc is mounted on an axis at the centre and a scale pan is attached to part of the circumference. To another part of the disc or wheel a weight is attached, which constantly gravitates towards a position below the axis of motion of the wheel or disc. And in order to indicate the quantity of weight placed in the scale, a hollow ring or circular tube is used, containing a fluid which gravitates constantly to the lower portion of the ring or circular tube, and points out the quantity on a dial.

Scott, U. *Certain improvements in the construction of vehicles and the various parts of the same.* Application dated September 17, 1855. (No. 2093.)

The object of this invention is to reduce the wear and tear of vehicles, and to lessen their vibratory action and noise. The patentee employs felt, made of hair, cotton, wool, flax or other materials, and used without any admixture, but with or without alternate layers of India-rubber for covering the surface of the parts, or he thoroughly impregnates the entire substance with a solution of India-rubber, paint, or other composition, and employs it in connection with the principal bearings, or as a substitute for any portion of the wood or iron at present used.

Forsyth, T. *Improvements in the treatment of scrap iron in the process of manufacture.* Application dated September 17, 1855. (No. 2094.)

This invention consists in treating ordinary wrought iron scraps as usually collected in heaps by systematically cleaning off all paint, dirt, or other extraneous matter by burning, previous to the scraps being

arranged in piles for welding, and thereby obviating the necessity of cleaning the scraps by scrubbing.

SMITH, W. H. *An improvement or improvements in bolts, latches, and locks.* Application dated September 17, 1855. (No. 2096.)

The improved bolt consists of a rod working in a case or tube which has a slot in its side, through which the handle of the bolt is connected to it. The case is inserted in the edge of the door. The bolt is secured to the door by screws passing through a flange on its end, entering the edge of the door. The handle of the bolt comes through a slot in the door, and also through a slot in a rose or plate of metal surrounding the slot in the door. A small vertical bolt working in the rose or plate may be made to lock the bolt, either when shot or withdrawn. The improved bolt may be used as a latch by giving to its projecting end the wedge-shaped form of a latch, and inserting a spring between the end of the bolt case and the inner end of the bolt; and it may also be used as a lock by placing the works of an ordinary lock above it, and causing the lock by the action of its key to shoot a vertical bolt, so as to engage with and fix the horizontal bolt.

TURNER, N. *Certain improvements in the manufacture known as gold wire and gold plate for the production of gold thread or gold lace.* Application dated September 17, 1855. (No. 2097.)

Hitherto gold wire and gold plate have been manufactured by coating or plating silver wire with thin gold. This invention consists in substituting aluminium in place of the silver wire in this manufacture.

CAIRD, J. T. *Improvements in steam-engines.* Application dated September 17, 1855. (No. 2098.)

This invention relates to apparatus to be applied to steam engines, particularly direct-acting vertical cylinder engines, for the purpose of obviating the shock occasioned by the descent of the piston, its rod, connecting-rod, and appendages, and consists in fitting up a small cylinder or pump in connection with the main working steam cylinder in such manner that the piston-rod of the latter, or a continuation of it, may work a piston fitted to the small cylinder. The lower end of the small cylinder is open to the atmosphere by lateral apertures, which also give access to the stuffing-box in the steam cylinder cover. The upper end of the small cylinder is fitted with a cover which is provided with a valve opening outwards only, so that when the steam piston rises and carries up the piston of the small cylinder, the latter expels any air that may be in the small cylinder, whilst, on its subsequent descent, the valve closes and excludes the air, so that a vacuum is formed within, and the consequent upward atmospheric pressure on the underside of the small piston balances the weight of the steam piston and connections.

COPLAND, G. *Improved fluid compound for the destruction of bugs and other insects.* Application dated September 17, 1855. (No. 2099.)

This improved compound consists of camphor dissolved in naphtha or other spirit, and oil of cloves or other essential oil or oils, to which may be added creosote.

DESTIBEAUX, J. H. *An improved waterproof fabric.* Application dated September 17, 1855. (No. 2101.)

The inventor first applies on the upper and under surfaces of a cotton or linen fabric, such, for instance, as that called moleskin, a coating composed of boiled linseed oil, rendered siccative by litharge, mixed with calcined amber and lamp black, and liquefied, where found necessary, by the addition of a small quantity of essence of turpentine.

HALCOMBE, J. J. *Improvements in the means of obtaining skeleton maps for educational purposes.* Application dated September 18, 1855. (No. 2105.)

These improvements consist in the use of stencil plates or patterns from which the outlines of maps may be pricked or marked off in colour, or by means of an instrument having a series of points arranged to the outline form of the country or countries to be delineated. This instrument being arranged somewhat similar to an envelope cutter, the prick points may be forced by pressure through a number of sheets of paper at one time, thereby marking the whole with the required outline set out in punctures.

BARRY, B. P. *Improvements in treating bituminous shale, boghead mineral, and other like schistous bodies, in order to obtain various commercial products therefrom.* Application dated September 18, 1855. (No. 2107.)

Schistous bodies are operated upon in order to obtain essential and unctuous oils; 1. Highly rectified mineral oil; 2. Mineral oil for lighting purposes; 3. Fat unctuous paraphinised oil; and 4. Mineral grease, through certain apparatuses. The inventor uses retorts for decomposing the schistous bodies. The pipes which lead the gases from the retorts enter partly into a receiver, placed at some distance from them. A condenser provided with refrigerating tubes condenses the raw oils and the ammoniacal waters. Purifiers formed of two wooden cases or jackets lined throughout with lead, and provided each with an agitator, are

employed to place the oils (after having been separated from the thick tar) in contact with five per cent. by weight of sulphuric acid of commerce. The matters must be agitated for three hours, left to settle, drawn off into a second purifier placed under the first, and then have added to them about five per cent. by weight of caustic soda, or a quantity of lime water, and the whole is well stirred for several hours and allowed to settle.

DEACON, H. *Improvements in the manufacture of solutions of carbonate of ammonia and in the manufacture of caustic ammonia.* Application dated September 20, 1855. (No. 2118.)

This invention consists of a mode of manufacturing solutions of carbonate of ammonia by passing solutions of caustic ammonia, or solutions of carbonates of ammonia, not sufficiently saturated with carbonic acid, down vessels containing coke, bricks, or some such materials, so as to distribute the solutions over a considerable surface at the time that carbonic acid gas is passed up such vessels. The ammoniacal solutions thus absorb carbonic acid, and the gases not absorbed are passed through condensers before escaping to avoid loss of ammonia by volatilisation.

EATON, J. *Improvements in shuttles and in making cop tubes used in shuttles.* Application dated September 22, 1855. (No. 2126.)

This invention consists in dispensing with the use of cop spindles in shuttles, and arranging the interiors of shuttles in such manner as to hold the cops of weft externally. The tube or spool is fixed at one of its ends in a shuttle, and elastic or pressing friction surfaces are used to hold the cop, by acting on its external surface; and in making metal cop tubes for shuttles, in place of making them externally smooth, and with uniform surfaces, they are to be grooved or roughed on the external surfaces, the object being to render the metal cop tubes, wherein the weft is wound, less liable to have the yarn stripped off.

MOTTET, H., Jun. *Scouring woollen goods during the action of fulling or otherwise.* Application dated September 24, 1855. (No. 2128.)

This invention consists in using liquid ammonia or volatile alkali, diluted with water, instead of employing salts of soda, soaps, and other cleansing ingredients usually employed for cleansing and fulling cloths and woollen goods.

PROVISIONAL PROTECTIONS.

Dated April 5, 1856.

821. James Jones, of Warrington, Lancaster. Improvements in railway chairs, and in the method of securing the rails to the same.

822. James Hogg, publisher, South Blacket-place, and John Napier, stereotyper, East Sciennes-street, Edinburgh. Improvements in stereotyping.

823. Obed Blake, Thames Plate-glass Works, Blackwall, Middlesex, manager. Improvements in the manufacture of glass.

824. Benjamin Kisch, of Kennington, Surrey, gentleman. An apparatus for containing an arrangement of cards or papers for selection. A communication.

825. James Webster, of Birmingham, Warwick, engineer. A new or improved elastic metallic tube, and the method of manufacturing the same.

826. Thomas Reeves Whitehead, of Manchester, Lancaster, book-keeper. Improvements in garments or apparatus to be used for sustaining the human body in water, or for acquiring the art of swimming.

827. Julian Bernard, Albany, Piccadilly, Middlesex, gentleman. Improvements in machinery or apparatus employed for manufacturing or making boots and shoes, or other coverings for the feet.

828. Edward Martin, of Oxford, cricket-bat maker. An improved leg guard.

829. Henry Thomas Sturley, of South Lynn, Norfolk. An improved compound or breakfast mixture.

830. Arnold Morton, of Wakefield, York. Improvements in the manufacture of paints and pigments.

831. William Porter Maddison, of Barnsley, York. An improved telegraph or apparatus for the transmission of signals.

832. William Henry Moore, of Wenlock-place, City-road, Middlesex. An improvement in the manufacture of candles.

833. Frederick George Underhay, of Well's-street, Gray's-inn-road, Middlesex. Improvements in apparatus for drawing off water.

834. Henry Craigie, of Edinburgh, W.S. Improvements in heating apartments where gas and water are used.

835. Joseph Betteley, of Liverpool, anchor manufacturer. Improvements in the manufacture of iron for knees for ships or other purposes.

Dated April 7, 1856.

837. Jacob Smith, of Union-court, Old Broad-street, and John Luntley, of New Broad-street-court, London. Treating the sunflower plant to render its fibres applicable to the manufacture of textile fabrics, paper, yarn, cordage, &c.

838. John Leigh, of Manchester, Lancaster, surgeon. The use or application of a certain substance or substances in the sizing, stiffening, or otherwise preparing cotton, linen, or other yarns and woven fabrics.

839. Ephraim Morris, of Bergen, New Jersey. Improved machinery for raising and lowering weights.

840. William Edward Newton, Chancery-lane, Middlesex, civil engineer. An improved construction of furnace for the manufacture of glass. A communication.

841. Charles Durand Gardissal, of Bedford-street, Strand, London. Preparing various resins and combining them with oils and fatty matters for manufacturing candles thereof. A communication.

842. Arnold Morton, of Wakefield, York. Improvements in the manufacture of paper-hangings for decorative purposes.

843. William Terry, of Birmingham, Warwick,

gunmaker. Improvements in breech-loading fire-arms.

844. William Coles Fuller, of Bucklersbury, Cheapside, London, India-rubber spring manufacturer. Improvements in constructing and adapting India rubber as tyres for wheels.

845. John Adams, of Grosvenor-street, Leicester. Improvements in knitting machinery.

846. William Henry Gauntlett, of the South Bank Iron Works, Eston Junction, near Middlesbro'-on-Tees. Improvements in thermometric apparatus.

847. John Graves, of London, gentleman, and William Frederick Henson, of Hampstead, Middlesex, civil engineer. Improvements in lubricating carriage and other axles.

Dated April 8, 1856.

848. Stephen Johnson Gold, of Newhaven, Connecticut, U.S. An improvement in apparatus for warming buildings by steam.

849. John Carrick Bowser, of Queen's-terrace, St. John's-wood, Middlesex. Improvements in glove fastenings.

850. Alexander Charles Louis Devaux, of King William-street, London, merchant. Improvements in the construction and the fitting up of granaries.

851. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in the process of manufacturing steel, and carbonizing iron, and the ores thereof, in the said manufacture. A communication.

852. William Joseph Curtis, of Sebbon-street, Islington. Improvement in lubricating the axles of locomotive engines, and of carriages on railways.

853. James Allen Ransome and George Arthur Biddell, of Ipswich. Improvements in the manufacture of railway bars and flanch bearers of railway crossings.

854. John Brooke, Crescent, Jewin-street, City. Improvements in lift pumps.

Dated April 9, 1856.

855. John Gedge, of Wellington-street South, Strand, Middlesex. Improvements in the treatment or preparation of leather, and in the manufacture of articles composed thereof. A communication from M. Sejac, of Paris.

856. Joseph Robert Whitgreave, of Rugeley, Stafford, gentleman. Improvements in the arrangement and construction of locomotive engines.

857. Henry Laxton, of Arundel-street, Strand, Middlesex, civil engineer. A new and improved apparatus for increasing the buoyancy of ships and other vessels. A communication from Alexander le Mot, United States.

859. John Armour, of Kirkton Bleach Works, Renfrew, N.B., bleacher. Improvements in bleaching textile fabrics and materials.

860. George Frederick Morrell, of Fleet-street, London. Improvements in the manufacture of railway chairs.

Dated April 10, 1856.

861. Henry Laxton of Arundel-street, Strand, civil engineer. An improved mode of adjusting circular saws. A communication from Amos D. Highfield and William H. Harrison, United States.

863. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in the means of attaching together or securing sheets and pieces of paper or manuscript documents. A communication.

864. Walter Hall, of Erith, Kent, India rubber manufacturer. A method of stopping or retarding the way of ships and vessels, in order to prevent collisions and otherwise.

865. George Homfray, of Ruabon, Denbigh. An improvement in furnaces.

Dated April 11, 1856.

867. Thomas Williams Makin, of Longsight, near Manchester, Lancaster, silk finisher, and John Barnsley, of Stockport, Chester, engraver. Improvements in machinery or apparatus for embossing moiré antique water on all kinds of woven fabrics.

869. James Burnside, of Henry-street, Sunderland, general traffic manager for the Sunderland Dock Company. Improvements in apparatus for propelling and steering ships and boats.

871. George Jackson, of Bilston, Stafford, iron master. A new or improved steam boiler, to be heated by the waste heat of puddling or mill furnaces.

873. Antoine Perpigna, advocate, of Paris, France. Improvements in the manufacture of coke. A communication.

Dated April 12, 1856.

875. Ludwig Schults, of Green-street, Stepney, Middlesex, photographic artist. Improvements in obtaining photographic pictures upon paper, glass, metal, plates, and other fibrous substances.

877. William Bragg Flint, truss manufacturer, of Birmingham, Warwick. Certain improvements in fasteners for shutters, windows, doors, and such like purposes, and which said fastening is also applicable to the coupling of railway carriages and trucks, and other useful purposes.

879. Robert Baird Lindsay, of Mill Wall Brewery, Poplar, Middlesex. An improvement in removing the scale or deposit from tubular flues of steam boilers.

Dated April 14, 1856.

881. George Braden and Charles Braden, of Sharp's-alley, Middlesex, manufacturers. Improvements in the manufacture of show tablets for advertising purposes.

883. John Symonds and Thomas Mara Pell, smelters and gold ores reducers, of Sufferance Wharf, Mill Wall, Poplar, Middlesex. Certain improvements in the reduction of gold, silver, and other ores.

885. George Davies, of Serle-street, Lincoln's-inn, Middlesex, civil engineer. Improvements in the method of soldering or uniting cast iron. A communication from Mathieu Joseph Receveur.

887. Jesse Bridgwood, of Burslem, Stafford, manufacturer. An improvement in the manufacture of china and earthenware plug wash-hand basins. A communication.

889. Samuel Cunliffe Lister, of Bradford, York. Improvements in spinning.

891. Samuel Cunliffe Lister, of Bradford, York. Improvements in weaving

893. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improved machinery for felting hat bodies. A communication from James Seely Taylor, of Danbury, Connecticut, U.S.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," April 29th,* 1856.)

2850. George Gotts Golding. Improvements in boilers for heating, warming, or raising steam.

2865. Alfred Vincent Newton. Improvements in washing machines. A communication.

2871. Richard Ruston. Improvements in the construction of anchors, and appendages to be used therewith.

2892. Matthew Tomlinson. An improved medical plaister.

2896. Henry Francis. Improvements in apparatus for cutting out parts of garments.

2897. Charles Glover. Removing snow from a line of railways.

2899. John Gedge. Improvements in cutting and folding paper to form letters or notes and envelopes in one piece. A communication.

2901. James Newman and William Whittle. Improvements in the manufacture of hooks and eyes, and in machinery to be employed in the manufacture of the hooks aforesaid.

2902. John Henry Johnson. Improvements in furnaces for steam boilers and other heating purposes. A communication.

2906. Edward Rowcliffe. Improvements in the manufacture of blocks or slabs for paving and building purposes.

2916. John Barton. Improvements in shuttles or shuttle tongues.

2919. Alexandre Tolhausen. Certain improvements in double acting pumps. A communication.

2942. Lewis Harrop, Samuel Barlow, and Alexander Boyd. Certain improvements in self-acting mules for spinning and doubling cotton and other fibrous materials.

2950. Thomas Holmes. An improvement in the manufacture of driving straps or bands for machinery.

2952. Sir John Scott Lillie. Improvements in guns, fire-arms, and implements of war connected therewith.

25. Colin Mather and Charles Millward. An improvement in steam and vacuum gauges.

40. Francis William Gerish. An improvement in the manufacture of cast hinges.

51. Victor Delperdange. Improvements in metallic and elastic packing.

63. Peter Armand Lecomte de Fontainemoreau. Certain improvements in Jacquard machines. A communication.

181. Joseph Hopkinson the younger. Improvements in apparatus connected with steam boilers.

337. Thomas Restell. Improvements in breech-loading and revolving fire-arms and in cartridges.

471. William Sangster. An improvement in the manufacture of umbrellas and parasols.

481. Louis Arnier. Improvements in condensing hot air, and obtaining motive power therefrom.

512. John Fowler, junior, and David Greig. Improvements in ploughing and tilling land.

584. James Mills. An improvement in spindles used in certain machines for preparing, spinning, and doubling cotton and other fibrous substances.

592. John Fowler, junior. An improvement in the manufacture of bricks and tiles.

606. Christopher Duckworth and Thomas Marsden. The manufacture of a new or improved woven fabric.

636. James Amos, of Frindsbury, Kent. An improved flour-dressing machine.

642. Thomas Bird. Certain improvements in castors.

720. Thomas Barnabas Daft. Improvements in the manufacture of metallic and other bedsteads, and articles of metallic and other furniture.

775. Thomas Walter Burrell. Improvements in machinery for obtaining power by water. A communication.

776. Henry Cornforth. A new or improved manufacture of plated tea-pots and coffee-pots, and other vessels and articles of like manufacture.

785. Etienne Laporte. The application of certain new materials in the manufacture of bougies, candles, and other similar articles.

840. William Edward Newton. An improved construction of furnace for the manufacture of glass. A communication.

850. Alexandre Charles Louis Devaux. Improvements in the construction and the fitting up of granaries.

851. William Edward Newton. Improvements in the process of manufacturing steel, and carbonizing iron, and the ores thereof, in the said manufacture. A communication.

854. John Brooke. Improvements in lift pumps.

859. John Armour. Improvements in bleaching textile fabrics and materials.

860. George Frederick Morrell. Improvements in the manufacture of railway chairs.

865. George Homfray. An improvement in furnaces.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

984. James Napier.
989. Charles Léon Desbordes.
1005. William Johnson.
1023. William Reid.
1027. Alfred George Anderson and John Barker Anderson.
1029. John Hetherington.
1030. Edward Bird.
1130. William Boggett and George Brooks Pettit.
1131. Conrad William Finzel.
1134. Sir John Scott Lillie.

LIST OF SEALED PATENTS.

Sealed April 25th, 1856.

2398. Henry Wyatt.
2406. John James Speed, Jun.
2414. William Hartley.
2431. Richard Pannell Forlong.
2437. George Milner.
2447. Isham Baggs and Henry Forfar Osman.
2466. William Gardner.
2476. Francis Hawkes the elder.
2502. William Kenworthy.
2552. Julius Homan.
2553. John Wilkinson the elder, and John Wilkinson the younger.
2562. Thomas Skinner.
2567. Charles Goodyear.
2578. William Lea.
2612. Alfred Vincent Newton.
2620. Oliver Maggs.
2622. Coleman Defries.
2694. William Irlam.
2736. William Beatson.
2739. William Henry Smith.
2815. Alphonse Louis Poitevin.
2816. Alphonse Louis Poitevin.
858. George Tomlinson Bousfield.

388. Charles Cowper.
450. James Diment.
496. Isaac Reckitt, George Reckitt, and Francis Reckitt.
540. James Wallace, jun.

Sealed April 29th, 1856.

2413. Germain Jean Paul Marie Villeroux.
2417. Paul Emile Chappuis.
2424. Robert Griffiths.
2435. Henry Laxton.
2440. John Pinches.
2450. John Patterson.
2458. James Eastwood.
2460. George Davis.
2462. William Robertson and James Henry.
2474. John Hicks.
2506. John Wakefield.
2519. Cullen Whipple.'
2643. John Henry Hutchinson.
2679. John Henry Johnson.
2711. Sir Charles Edward Grey.
2719. William Rowan.
87. William Smith.
203. John Beads.
233. Henry Samuel King.
301. Edwin Clark.
325. Thomas Frederick Tyerman.
369. William Edward Newton.
371. Alfred Vincent Newton.
386. William Watson Hewitson.
405. Alfred Vincent Newton.
419. Charles Scott Jackson.
460. Edward Schischkar.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

The publication of several Articles and Letters is deferred.

CONTENTS OF THIS NUMBER.

Dale's Machine for Working Wood Mouldings (*with engravings*) ... 410
On Large Bells and Bell Machinery ... 411
Proposed Canal between the Atlantic and Pacific Oceans ... 414
On Photo-Galvanography; or, Engraving by Light and Electricity ... 415
On Osmodic Force. By H. Prater, Esq. ... 416
Surplus from Patent Office Fees ... 417
Lomax's Improvements in Steam Engines ... 418
Biddell's Improvements in Railway Crossings 418
Durant's Registering Apparatus for Public Carriages ... 419
Improvements in Cutting Stone ... 419
Marchinton's Improvements in Vices ... 419
Bobbin Net or Twist Lace Machines ... 420
Note on Tonnage Admeasurement ... 420
Governmental Insanity! Putting Out of the Way the Art and Trade Collections of London ... 420
Mechanical Locomotion ... 421

Specifications of Patents recently Filed:

Hill ... Fire-proof Material ... 423
Sangster ... Stays and Corsets ... 423
Zenner ... Separating Ores ... 423
Gordon ... Telegraph Wires ... 424
Ford ... Waterproofing Solutions ... 424
Lewtas ... Holding Chains, &c. .. 424
Gibbs ... Moulded Articles ... 424
Brooman ... Raw Silk ... 424
Bright and Bright ... Electric Telegraphs .. 424
Brooman ... Knitting Machinery. 425
Smith ... Break for Carriages .. 425
Newton ... Paddle-wheels ... 425
Warren ... Vices ... 425
Willis ... Umbrellas, &c. ... 425
Cornides ... Transferring Prints. 425
Biddell ... Railway Crossings ... 425
Coulson ... Metal Teapots, &c. ... 425
Lomax ... Steam Engines ... 426
Brooman ... Preserving Meat, &c. 426
Linsey ... Large Books ... 426
Page ... Moulding Metals ... 426
Palmer ... Reaping Machines ... 426
Lees and Clegg ... Looms ... 426
Dale ... Chemical Products ... 426
Parkinson ... Railway Breaks ... 426
Brasseur ... Winding Weft ... 427
Pollitt & Eastwood ... Churning ... 427
Chalmers ... Piled Fabrics ... 427
Beattie ... Furnaces, &c. ... 427
Marchinton ... Vices ... 427

Provisional Specifications not proceeded with:

Scully & Heywood ... Applying Aluminium 427
Hamilton ... Weighing Apparatus. 427
Scott ... Vehicles ... 427
Forsyth ... Scrap Iron ... 427
Smith ... Bolts, Locks, &c. ... 428
Turner ... Gold Wire and Plate 428
Caird ... Steam Engines ... 428
Copland ... Destroying Bugs, &c. 428
Destibeaux ... Waterproof Fabric ... 428
Halcombe ... Skeleton Maps ... 428
Barry ... Bituminous Shale ... 428
Deacon ... Ammoniacal Solutions ... 429
Eaton ... Shutters ... 429
Mottet ... Scouring Goods ... 429

Provisional Protections ... 429
Notices of Intention to Proceed ... 430
Patents on which the Third Year's Stamp-Duty has been Paid ... 431
List of Sealed Patents ... 431
Notices to Correspondents ... 432

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1709.] SATURDAY, MAY 10, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

PALMER'S IMPROVED REAPING MACHINE.

Fig. 1.

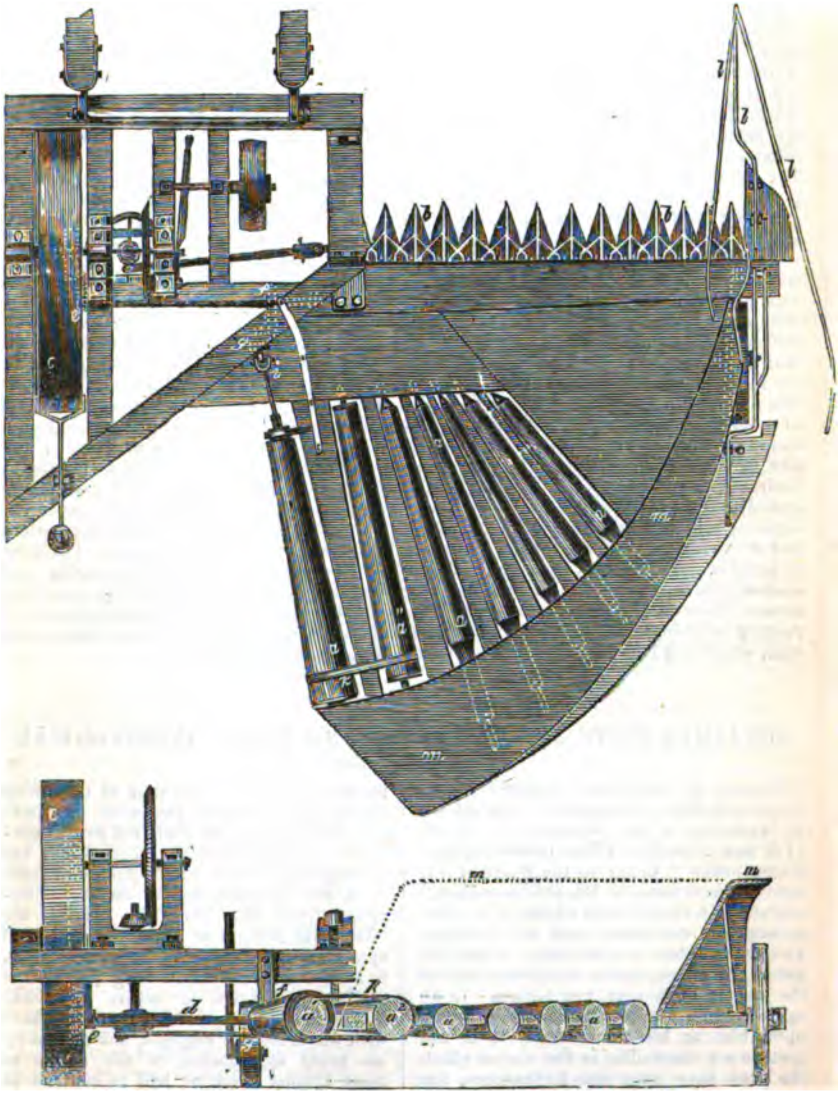


Fig. 2.

PALMER'S IMPROVED REAPING MACHINE.*

Mr. J. Palmer, of Stockton-on-Tees, has recently patented an invention, the object of which is to render reaping machines more efficient in their action than heretofore. This he proposes to effect, firstly, by applying to a reaping machine a novel construction of radial roller platform, which is intended to receive the agricultural produce as it is cut, and facilitate its discharge on to the ground; secondly (for the purpose of gaining strength without increasing the weight of the implement), by making the separator which divides the corn to be cut from that which the machine is to pass of steel, and the side plate or fence of the platform of galvanized iron.

Fig. 1 of the engravings in the preceding page represents, in plan view, a reaping machine with his improvements applied thereto; and fig. 2 is a sectional elevation of the same. *a, a* represents a series of conical rollers, mounted radially in suitable framing set in the rear of a line of cutters, *b*, which act within a space circumscribed (as would appear in a side elevation of the machine) by the periphery of the running wheel, *c*. "To render the action of the radial platform more efficient than those in use prior to the date of my patent, I impart rotary motion," says Mr. Palmer, "to the last one or two of the rollers, *a*, by means of gearing, which is driven by the rotation of the running wheel, *c*. The rollers, *a'* and *a''*, are represented as connected with the motions of this wheel, for the purpose of being rotated independently of the action of the rake, which, as applied by the attendant to draw back the cut produce from the front of the machine, imparts rotary motion to the forward rollers, *a, a, a*. *d* (figs. 1 and 2) is a shaft, which carries a spur wheel, *e*, in gear with a ring of teeth on the inner periphery of the wheel, *c*. At its other end this shaft is fitted with a bevil wheel, *f*, that gears into a pinion, *g*, keyed on a stud axle, *h*, carried by a bracket pendent from the main framing. To this stud axle, *h*, is attached, by means of a swivel connection, a rod, *i*, which is provided with a squared socket, that takes on to the squared end of the axle of the roller, *a'*. It will thus be seen, that as the machine is drawn forward over the ground, rotary motion will be imparted to the roller, *a'*, in the direction of the arrow, fig. 1, and thus the cut produce brought up to this roller will be delivered by it on to the ground in a line parallel or nearly so to the line of progress of the machine. When thought desirable, rotary motion may be communicated from this roller to one or more rollers of the series by means of a band or strap, *k*; and ribs or other projections may be formed on the periphery of the last roller, if thought desirable, to enable it to take a better hold of the produce fed up to it by the rake of the attendant. *l l* is the separator, which precedes the cutters, and marks the division in the standing crop between the portion to come under the operation of the advancing cutters and that which is to be left for the return action of the machine. This separator I propose to make of steel to give it strength; and the better to insure its action when passing over uneven ground, I joint it to its bearing, thus permitting of its rising and falling to accommodate itself to the ground. Another improvement which I effect in the construction of reaping machines is, forming the side plate or fence, *m m*, of the platform of galvanized iron, which will resist the deteriorating effects of damp and moisture."

SIR JAMES SOUTH AND THE ROYAL AND ROYAL ASTRONOMICAL SOCIETIES.

Under the heading "Disputes in the Royal and Royal Astronomical Societies," we reviewed in our Numbers for March 17th and 24th, 1855 (Nos. 1649—50), Mr. Sheepshanks' "Letter to the Board of Visitors of the Greenwich Royal Observatory," respecting a subject with which, as it commenced and developed itself in this Magazine, our readers are familiar. Since that period, Mr. Sheepshanks has passed beyond the sphere of human retribution. If we again resume our pen to comment briefly upon him or his transactions, it is not that we are insensible to the claims which the dead have upon our forbearance, but purely because the reputation of the living cannot be otherwise protected. In penning what follows we shall not permit ourselves to forget that Mr. Sheepshanks has no longer a voice to raise in his own behalf.

In the "Proceedings of the Royal Society" (vol. vii., No. 17), among the "Obituary Notices of Deceased Fellows," appears a brief memoir of Mr. Sheepshanks, in which occurs the following passage:—"His consideration for others was made manifest by his active kindness to those with whom he was engaged, and no less by his ready appreciation of the merits of those against whom he had to contend in

* Patent dated 20th September, 1855, No. 2120.

defence of truth and justice, as they appeared to his mind. Nor must we omit to add, while using a qualifying expression to save the right of free opinion, and to avoid implying a decision which is not within our province, that in every one of his controversies, that which was truth and justice to the mind of Mr. Sheepshanks was nothing less to the minds of very many from whom no thinking man would differ without cautious examination."

In the "Report of the Council (1855-56) to the Thirty-sixth Annual Meeting of the Royal Astronomical Society" (vol. xvi., pages 96, 97), occurs the following passage: — "The last of Mr. Sheepshanks' publications was a defensive pamphlet, or partly defensive, in answer to an imputation, to which we need not here allude further than by describing it as an impeachment of his integrity, upon the evidence of a conversation alleged to have been held thirty years before it was brought forward, with an eminent man who died twenty years before it was brought forward. Of course, this sort of evidence never received the slightest attention from any of the scientific bodies before whom it was proposed for inquiry; nor would it have been mentioned here, public as the matter has become, except simply to record that sense of the utter needlessness of any reply to such an accusation, which the Council showed when they neglected the formal application made to them on the charge."

Now, we submit, that these passages are of an essentially unfair, vexatious, and evil character, inasmuch as they compel Sir James South, ourselves, and others, either to receive silently the imputations they convey, or to re-exhibit the failings and depravities of the dead—a course which is repugnant not only to ourselves, but to all, save a very small and exceptional class who delight in traduction, either of the living or the dead, and who do not scruple, it appears, even to embitter their eulogiums of the departed with inuendoes against the living. This remark would hold, from whatever source the above ill-conceived and indecorous passages proceeded, but the spirit which instigated their publication is seen to be peculiarly gross when it is remembered that they were written by, or rather put forward in the name of, the councils of two societies in which the delicacies, or at least the proprieties, of ordinary life should be thoroughly understood, and whose public acts and documents should be scrupulously purged of every trace of personal malevolence with which mean minds may seek to taint them. This will be (and indeed is, as we learn) better understood and more warmly felt by the members generally of these societies, than by the writers of the passages stigmatized, or by those who either foolishly or maliciously sanctioned their publication.

So far as we are concerned we shall not permit ourselves to reply, at any length, to the statements in question. The only rejoinder which Mr. Sheepshanks could make to our criticism of his pamphlet, and our exhibition of his faults, was too weak and unfounded to bear examination, and therefore was never put publicly forth. What he, with all the confidence and courage which he unquestionably possessed, could not effect, his partizans will not accomplish by cowardly craft. We regret to observe their attempts. The better course would have been to let their friend repose. Had they done so neither we, nor any, we believe, of those who in life were his antagonists, would have again laid a finger upon his character. While we live we are compelled to admonish and contend with the living; but we desire most earnestly to respect the peace which death inaugurates, and which is so well suited to all the weary and the frail.

> "Our curse upon the clown and knave
> Who will not let his ashes rest."

We will here content ourselves with two observations. First, that which is said in the Royal Society's obituary notice, if true, is no more than may be said with perfect veracity by the opponents of Mr. Sheepshanks, viz., that that which is truth and justice to their minds is "nothing less to the minds of very many from whom no thinking man differs without cautious examination." The consideration is, however, as lame and impotent as it is old, and brings but feeble aid to either party. Secondly, the self-constituted counsel of the deceased conduct his case very badly when they talk in the Astronomical Society's Report of the "utter needlessness of any reply" to an accusation, *because* that accusation is based "upon *the evidence* of a conversation alleged to have been held there thirty years before it was brought forward, with an eminent man who died twenty years before it was brought forward." Mr. Sheepshanks himself evidently knew that the *mere remoteness* of the event did not deprive it of its force, for as soon as the circumstance was mentioned at the Royal Society he declared that it was imperative upon him to meet the charge, and, contrary to rule and order, insisted on being heard.* Moreover it is much more natural to suppose (apart from all other considerations) that Sir J. South refrained for

* See *Mechanics' Magazine*, vol. lx. p. 223. No. 1596.

several years from making a fraud public, than that he should have put forward an accusation based upon a vile invention of his own. No colouring can conceal, and no sophistry can shake this fact. Besides, Mr. Sheepshanks himself admitted the truth of the very allegation upon which the Council seek to pour contempt. For ourselves we are content to leave the matter here.

It must be remembered, however, that to Sir J. South the reflections upon him contained in the passages above quoted must be peculiarly offensive, and we are not surprised to find that he has in reply addressed a very dignified and temperate, but most convincing letter, to the fellows of the Royal and Royal Astronomical Societies.

Our readers will recollect that in the article referred to at the commencement of this paper ("Disputes, &c.") we wrote as follows: "We shall not occupy ourselves with a reply to his" (Mr. Sheepshanks') "profuse and contradictory criticisms of Sir James's character and abilities. When it is remembered that the author is Mr. Sheepshanks, and the subject he who gave to the light the humiliating transactions of that gentleman before discussed, there will be no room to wonder at their bitterness, and no necessity, we conceive, to demonstrate their injustice. If Sir James thinks otherwise, it will certainly cost him but little trouble to deal effectively with that which contains its own refutation." We subsequently learned that it was not the intention of Sir James to reply to Mr. Sheepshanks. The reasons for this are given in the following passage from the letter of Sir James. "Having been told that this pamphlet was replete with abuse of myself, I, without reading it, placed a copy of it in the hands of Mr. A. J. Stephens, one of the Fellows of the Royal Society, and requested him, as 'my friend,' to advise me how to act. A few days afterwards, Mr. Stephens advised me not to take the slightest notice of the pamphlet, or even to read it. He also considered that, as the pamphlet purported to be a 'Reply to the Calumnies of Mr. Babbage,' it was more incumbent upon Mr. Babbage to publish a reply to the abuse of Mr. Sheepshanks than a duty devolving on me. Mr. Stephens, at a subsequent interview, also stated that Lord Rosse and Dr. Paris concurred in opinion with himself, that I ought not to take any notice of Mr. Sheepshanks' pamphlet. Placing the utmost reliance on the judgment and friendship of Mr. Stephens, and Mr. Babbage having acquainted me that he intended to answer the calumnies of the Reverend Richard Sheepshanks, I neither replied to, nor did I even read the pamphlet or any portion of it, until after my perusal of the 'Obituary Notices of Deceased Fellows' of the Royal Society for 1854—55, and after the Council of the Royal Astronomical Society had made their report to the thirty-sixth annual general meeting of their society."

Before entering upon the statement which Sir James now deems it essential to submit, he says, after quoting the passage above extracted from the "Report of the Council," "The late Council of the Royal Astronomical Society having thus made the adulation of the *dead* a means of slandering the *living*, and alluded to the personal differences which existed between the late Reverend Richard Sheepshanks and myself, I am most reluctantly and painfully compelled to refer to matters from which I should otherwise have refrained.

"I may, perhaps, be permitted to observe *in limine*, that in the 'Obituary Notices' which are published by the Councils of the Royal and Royal Astronomical Societies, common decency requires that they should contain nothing likely to stir up personal feelings: the works of the deceased person, any details of his history likely to encourage others in the pursuit of science, any praise of him consistent with *truth*, are legitimate topics for such notices, but it is an abuse to make them *libels on the living*; and not less so to identify Societies with the bad passions of individual members of their Councils."

With these remarks we quite agree, as has already been intimated.

Sir James then proceeds with his statement, which is as follows:

"On the 19th of January, 1852, Mr. Babbage came to Campden Hill, brought with him the Review of his 'Exposition, 1851,' which had then recently appeared in the *Mechanics' Magazine*, and read it to me. On his coming to the words, 'If this be not subornation of perjury, it is very like it,' I reminded him of a real case of subornation of perjury in which, on the late Mr. Troughton's words to me, the Reverend Richard Sheepshanks had asked Mr. Troughton to let one of his men go to the Custom-house to clear, as an English instrument, a circle of Jecker's, on which Mr. Sheepshanks had had engraved the name of 'Troughton,' to evade the duty."

The result of this conversation was, that the letter, with which our readers are acquainted, was addressed to this Magazine.*

"I am charged by the late Council of the Astronomical Society," continues Sir James South, "with having, in the foregoing letter, impeached the integrity of the late Mr. Sheepshanks, upon a con-

* See *Mechanics' Magazine*, No. 1485.

versation held thirty years before it was brought forward, with an eminent man who died twenty years before it was brought forward.

"In my letter to the *Mechanics' Magazine*, I made, upon the authority of the late Mr. Troughton, two charges against the late Reverend Richard Sheepshanks.

"(1.) That he had procured from Paris one of Jecker's circles, and that he evaded the payment of the duty by having the name of 'Troughton' engraved upon it.

"(2.) And that to evade the payment of the duty, he must either have been guilty of perjury, or subornation of perjury.

"In the 'Defensive Pamphlet' of the late Reverend Richard Sheepshanks, as the late Council of the Royal Astronomical Society have ludicrously described it, he thus writes (page 8):

'I saw a favourable account, by Sir Thomas Brisbane, of the performance of a circle of reflexion by Jecker of Paris; and, as a friend was going to Paris, in the winter, I believe, of 1823, I requested him to procure me a circle of Jecker's, and to get Troughton's name engraved upon it, so as to pass our Customs without duty, and without causing him delay or trouble. This was done, and the instrument, I am pretty sure, left by him at Troughton's shop in Fleet-street, to have the inscription erased, and to be adapted to the stand of a British circle which Troughton had recently sold me. It is most probable that the officers at Dover had their attention drawn to the erroneous inscription by the Commissioner, and so passed it; but I can say nothing about this of my own knowledge.

'I own that I am heartily ashamed of this transaction, although everybody smuggled in those days, directly or indirectly.'

"Can any unprejudiced person deny that Mr. Richard Sheepshanks has admitted,

"(1.) Procuring a 'circle of Jecker's' from Paris; and 'getting Troughton's name engraved upon it;'

"(2.) 'So as to pass our Customs without duty?'

"In respect of 'the perjury, or the subornation of perjury,' it is clear that, in 1823, the 'Circle' could not have passed 'our Customs' without some person taking an oath that it was of British manufacture; but to this part of the transaction the Reverend Richard Sheepshanks cautiously and judiciously avoids giving any positive information or denial, although he confesses that he is 'heartily ashamed of this transaction.'"

(*To be continued.*)

RENNIE'S IMPROVED MARINE BOILERS.*

When marine boilers are required to be of the least possible height, so as to be kept below a certain level in the vessel—as, for example, below the load water-line—they are frequently liable to prime, or discharge the water contained within them along with the steam into the cylinders, and thereby cause damage to and impede the perfect working of the engines; and as it is a desideratum in all steam engine boilers, but in marine boilers more particularly, that the steam shall be delivered to an engine in as dry or free a state as possible—that is, not surcharged with water—Mr. G. Rennie, of the well-known firm of Rennie and Sons, Holland-street, Blackfriars, has designed the following arrangement by which boilers can be constructed so low as to enable them to be fixed in all ordinary cases below the water line of a vessel, while at the same time the surcharging of the steam with water, "or priming over," is obviated, and the delivery of the steam to the engine in a suitable state is secured.

This is effected in the following manner:—To the boiler is added a chamber, which may either be an extension thereof, or may be a distinct vessel, of suitable strength and size, having an opening or passage to the boiler as high up in the steam space as convenient, but such opening or passage must not be of a less area than the bore of the pipe for the supply of steam to the engine or engines. This steam chamber need not be subject to the direct action of the fire, but it must be maintained at a sufficient high temperature, so as to impair the elastic force of the steam, or allow of its condensing within the vessel or chamber. The steam pipe must be inserted in the most convenient position in or near the top of the steam chamber. In the bottom of this chamber there should be inserted a pipe with a blow-off cock, so as at any time to free it from the presence of water, which might be carried over along with the steam. Gauge cocks, by which the height of condensed water can be readily ascertained, are used.

Fig. 1 of the accompanying engravings is a longitudinal section of a low boiler for a vessel of shallow draft (in which the furnaces are placed athwart-ship, instead of fore and aft), fitted with such a chamber. A A is the shell of the boiler; B B are the furnaces; C C the tubes; and D is the chamber. Instead of permitting the steam to be drawn direct from off the surface of

* Patent dated 2nd October, 1855, No. 2195.

the water into the steam pipe in such a boiler, a screen-plate, E, is interposed between the opening from the boiler—or more than one plate may be inserted, as shown in fig. 2—for more effectually drying the steam as it passes from the boiler A,

Fig. 1.

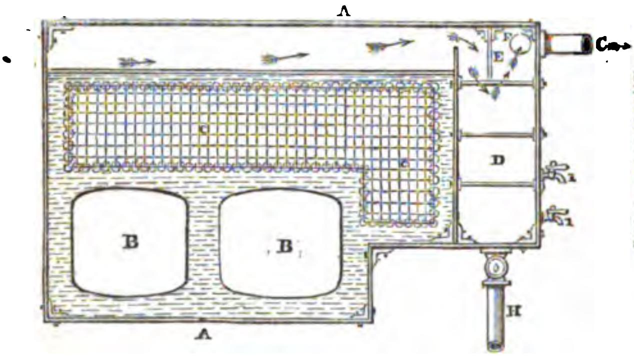
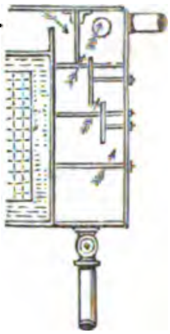


Fig. 2.



through the steam chamber, D, and through the opening, C, into the steam pipe, F, as the steam in passing over would impinge against the screen plate, and cause it to part with the water, which will fall and collect at the bottom of the chamber, D, which is provided with a blow-off pipe and cock, H. I I are two gauge cocks for ascertaining the quantity of water within the chamber. A wash-board or dash-plate may be fixed within the boiler, across and before the opening made between the boiler and the steam chamber, for the passage of the steam, for the purpose of checking the ebullition of the water.

In the engraving the chamber, D, is shown as a continuation of the boiler, A, because the peculiarities of the construction and position of that boiler permits of its being so applied most advantageously; but Mr. Rennie does not confine himself to the precise arrangement shown, as similar drying chambers may be added to marine boilers either at the side or end.

PUGH'S RAILWAY SIGNALS.

Mr. E. Pugh, of Chartham, Kent, has patented an invention for use on railways, by which he proposes to give—1st, the guards a simple and cheap means of signalling the engine driver: and 2nd, the passengers a simple and efficient means of calling the attention of the guard or guards to the particular carriage or compartment of a carriage from which the signal has been exhibited by night or by day.

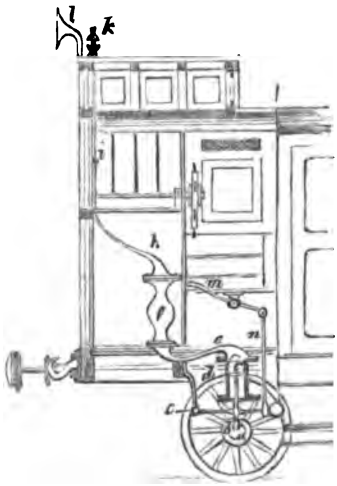
The first part of the invention relates to the use of a reed, valve, or whistle, or such like signal, in conjunction with an air vessel, into which air is charged or compressed by the travelling of the brake-van or other carriage to which such apparatus is applied, the compressed air from such air vessel being permitted to pass through the stop-cock upon its being opened, and along the whistle tube, causing the whistle to sound an alarum, by producing either a continuous sound or a series of distinct sounds, according to any pre-arranged method of signalling. The air vessel is charged by means of a suitable pump affixed to the guard's van, and worked by means of a cam, eccentric, or other mechanical contrivance, for causing the piston of the pump to move backward and forward within the barrel, and the connection between the pump and the air vessel contains a suitable valve, by which the air is retained under pressure ready for use.

The second part relates to a means by which passengers can attract the attention of the guards by night or by day. For this purpose a rod is fixed along the length of each carriage, with a handle or means of working it in each compartment. This acts upon a disc, semaphore, or lamp signal, which is fixed outside in the most suitable position.

The third part relates to the conversion and use of the roof lights of carriages, as also the outside or other lamps of a railway train into signal lamps, when necessary or desirable. This is effected by fitting roof lights or lanterns glazed with coloured glass, instead of the iron guard cases and covers at present used, to contain the roof lamps; and when a passenger desires to call the attention of the guard or guards, he raises the lamp into the proper position, and causes the proper coloured glass to exhibit a suitable light up or down on either side of the line. In the same way

the passengers are enabled to alter the colour of the light, or the position and colour of the side or other lamp by lever handles or pulls placed inside the carriages.

The annexed engraving is part of a side elevation of a guard's van with part of the guard's box broken away to exhibit portions of the apparatus relating to the first part



of the invention. In this figure the pump is purposely drawn of such a size as the better to exhibit the mode of working rather than correctly to define the relative proportions of the pump and the air vessel, or its fittings. *a* is a cam or eccentric, fixed upon the axle, and revolving with it; *b* the forked end of the plunger or piston rod. This fork works on and is raised by the eccentric. *c* the piston or plunger, shown fitted with fly-valves; *d* the cylinder; *e* the pipe communicating with the air vessel; *f* the air vessel; *g* a foot valve to the air vessel, and between it and the pump barrel; *h* the pipe from top of air vessel, communicating with the whistle or horn, having a stop-cock, *i*; *k* the whistle; and *l* the horn, each having an independent stop-cock, by which the sounds can be produced from each separately or combined, as may be required. The horn or trumpet-mouth is made to turn either way, and it has a reed or whistle in its throat. *m* is a foot lever or treadle, with a lever, *n* and *o*, arranged for throwing the pump into or out of gear. The end of the lever may be suitably balanced to overcome the friction, and keep it in contact with the cam.

The patentee does not confine himself to a single-acting pump, but may use instead thereof a double-acting pump, which receives the air at both ends, and ultimately forces it from each end; in which case he proposes to use an eccentric and strap, instead of the cam and fork with the counterweight, and the pump may be fixed horizontally, with the air vessel in any convenient position. He applies a safety-valve to the air vessel, and loads it to a suitable pressure. Instead of fitting the cam or eccentric in the middle of the axle, it may be fitted on to one of the bosses of the carriage wheel.

HUGHES' COMPENSATING WEDGES.

In locomotive engines, as is well known, the cylinders, after being in use for some time, become worn to a barrel shape internally, by the action of the piston. This is owing to the angular action of the connecting rod, which is insufficiently counteracted by the guides in which the piston-rod cross-head works; these guides, or the cross-head slides, become gradually worn, and so allow of play. Several expedients have been tried for compensating for this wear of the slides and guides, but without success, chiefly on account of requiring to be adjusted by a skilled mechanic.

Mr. Hughes, of Loughborough, has recently introduced another method which consists in adapting and applying to the parts of the mechanism liable to wear by the continued friction of the rubbing surfaces, a wedge of brass or other suitable material, which may be driven forward so as to bring such surfaces in closer contact, as may be required. The wedge may be applied either to the stationary guide or to the sliding piece of the mechanism, but the latter is preferred, and it may be held in its required position by means of a bolt or set screw. The wedge may also be applied in cases wherein both the rubbing surfaces are in motion. A model of the invention may be seen at the Exhibition of the Society of Arts. "This compensating contrivance," says the exhibitor, "can be adjusted at any time by the engineman. This system of compensating wedges is applicable to all engines and other machines, where wear is produced by surfaces rubbing on one another by a rectilinear movement, and will be found beneficial in engines, whether locomotive, stationary, or portable, which are driven by at quick speeds."

EXPERIMENTS WITH WHITWORTH'S RIFLE CANNON.*

A number of experiments have recently been performed at Manchester with Mr.

* See *Mech. Mag.*, vol. lxiii., p. 152.

Joseph Whitworth's rifle cannon, which has been described in our pages. The gun employed was what would otherwise have been an ordinary 24-pounder howitzer. It was cast at Woolwich, solid, and sent to Mr. Whitworth, who bored and rifled it with the machinery specially prepared for the purpose. It weighs 13 cwt. The bore is polygonal and spiral; but instead of being of a calibre sufficient to take in a 24-pound spherical ball, it is only of the capacity of about a 9-pound ball. The bore measures from side to side 4 inches, and is 54½ inches in depth. It is entirely finished by machinery, and the balls are accurately fitted, the spiral in both cases being beautifully formed. Although, as we have said, the gun is only the size of a 24-pounder howitzer, the balls Mr. Whitworth uses are 24 lbs., 32 lbs., and 48 lbs., these weights, in a bore of the small calibre mentioned, being obtained by an increase in the length of the balls. It will thus be seen that a gun, which, under the present system of construction, is only capable of supporting the strain of a 24 lb. ball, will, by Mr. Whitworth's plan, throw a 48 lb. shot—a sufficient thickness of metal being left on account of the reduced calibre. The experiments on Saturday were with 32 lb. and 48 lb. balls, the lengths of which were respectively 11¾ and 16½ inches. The balls are pointed, the end which goes first being shaped and rounded like the small end of an egg. The base is flat, and slightly concave in the centre. The cannon was mounted on an ordinary artillery carriage, and placed on the north-west side of the grounds, with the muzzle towards the south-east.

The following Table represents the nature and results of the first series of experiments:

No. of Experiment.	Weight of Ball.	Charge of Powder.	Elevation.	Range.
1	32 lbs.	2½ oz.	45°	Yards. 423
2	„	3 „	„	621
3	„	„	„	617
4	48 lbs.	„	„	420
5	„	5 oz.	„	735
6	„	6 „	20°	600
7	„	7 „	„	687

Another class of experiments was next commenced, with the gun at a very small elevation, by which the balls grazed the ground at comparatively short distances, and, rebounding, pursued their course, grazing again and again, till their momentum was expended. The first shot was with a 32 lb. ball and a 3 oz. charge, the gun being placed at an elevation of only two degrees. The projectile first grazed the earth at a distance of 92 yards, leaving a deep impression about 6 feet in length, and distinct indications of its spiral form and rotatory motion. It bounded from this, reaching an elevation of about 6 feet, and grazing the ground again at 64 yards. The next grazing (probably owing to the earth being hard at the latter point of contact) was at a distance of 70 yards further, whence it entered a ploughed field, grazing the ground several times, and came to rest at a total distance of 492 yards.

The next shot was with another 32 lb. ball; the same charge (3 oz.), but with the gun at an elevation of three degrees. The ball, in this instance, first grazed the ground at a distance of 108 yards; and rebounding, grazed again, 126 yards further on; but having touched the lower bar of an iron fence, which seemed to trip it in its course, it came to a stand in the ploughed field at the same distance as the former (490 yards.) The three last experiments were with 48 lb. balls.

It should be observed that the smallness of the charges used necessitated the employment of oak waddings to fill up the space in the powder cavity, which was very much to the detriment of the power of the gun.

Mr. Whitworth's new brass cannon, with hexagonal bore, was tried on the north shore, Liverpool, on Wednesday last, May 7, under the superintendence of Colonel Griffin, commander of the Royal Artillery Militia throughout the northern and midland districts. Several shots were fired, ranging from 24 to 48 pounders. The first shot was with a 24 lb. ball. with 11 lbs. of powder, and the extreme distance obtained was 2,800 yards, the elevation of the cannon being eight degrees. The experiments were not carried to a test of the *maximum* capacity of the gun, owing to the rapid rising of the tide. The average distance to which a 48 lb. shot was fired was 3,000 yards, but a much greater distance is expected to be obtained. Further experiments are to be made on a future day with hemispherical, round, and oblong shot, the latter being pointed at both ends.

IMPROVEMENTS IN THE MANUFACTURE OF CAST STEEL.*

Captain F. Uchatius, of Vienna, has recently introduced certain improvements in the manufacture of cast steel, the object of which is to reduce the cost of manufacturing it, by economising the labour of the process. The following is an abstract of the specification of his patent: Iron of the purest quality is taken and melted in a suitable furnace, and while in a molten state, is run into cold water, and thereby reduced to a granulated iron. It is then in a suitable condition to undergo the process which will convert it into cast steel. This process is founded on the fact that cast iron, surrounded by any oxygenised materials, and subjected to a cementing heat for a given time, will yield up a portion of its carbon, which will combine with the oxygen driven off from the surrounding materials, and form carbonic oxide, or carbonic acid gas. If this process is interrupted before the completion of the process, a partially decarbonized iron will result, the surface of which will have been converted into pure iron, while the interior parts remain unchanged. Or, in other words, the progress of the decarbonising action will depend on the amount of metallic surface brought into contact with the oxygen-yielding material with which the iron is surrounded. In order, therefore, to expedite this operation the pig iron is reduced, as before-mentioned, to a granulated state, and further to economise fuel and labour, the inventor avails himself of the heat required for effecting the decarbonisation of the iron, to reduce the metal when sufficiently decarbonised to a molten state, and thus by one and the same heating to convert it into cast steel, which need only be forged to prepare it for the market. The granulated iron is mixed with, (say 20 per cent. of) roasted, pulverised, sparry iron ore, and (4 per cent. of) fire clay; these substances are placed in fire clay crucibles, and subjected to heat in a cast steel blast furnace of an ordinary construction.

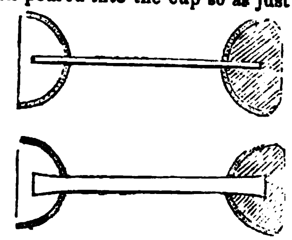
HOPE'S IMPROVEMENTS IN PRODUCING DESIGNS FOR NEEDLEWORK ON FABRICS.†

Mr. G. C. Hope, of Hastings, has recently introduced a method of producing effects resembling "applique" work, by printing on to textile fabrics patterns, figures, or devices, either by means of what is known as block printing, or by means of printing and embossing, the work thus produced being intended to be subsequently finished, or ornamented at pleasure, by needlework. The pattern, figure, or device may be of a different shade or colour from that of the ground on which it is printed. In carrying out the invention, it is found preferable to employ block printing, as then the design enters well into the body of the cloth, and is not liable to wear off; but for many purposes the design is applied by surface printing from stone, copper, or otherwise. The pattern may be produced either by printing it upon the ground, or the cloth itself may be made to form the pattern, another colour or colours being employed to fill up the parts of the fabric surrounding the pattern.

* Patent dated October 1, 1855. † Ibid.

CAPTAIN NORTON'S DISSOLVING-BAND RIVETS FOR CONCUSSION-FUZES.

The rivet with one head is inserted in its socket in that part of the fuze which, when fixed in the shell, is immediately within it. When thus inserted, a cup of iron, the same as that which forms the culot of the Minié ball, is fitted on the other end of the connecting-bar, which may be a slip of plate-zinc, with both ends slightly dovetailed, passing through an orifice in the centre of the bottom of the cup. Melted fine solder is then poured into the cup so as just to fill



it. On the fuze burning *below* the connecting bar the band is dissolved, and on the shell striking the object, the heads of the rivets start out of their sockets by the violent jar, and the charge of gunpowder within the shell is instantly exploded by the communication of the fire from the fuze.

Davy's diamond cement answers extremely well for the securing of the connecting-band, whether of thread, cane, or other fibrous matter. Or the ends of the connecting-bar may also be made fast in the cup-formed head of the rivet, with a putty made of plaster of Paris and size: this, when dry, becomes as hard as stone.

TOLSON'S CLOTH PATENT.

An application has been made to the Lord Chancellor by certain patentees who had obtained a patent three years ago for an invention for effecting a purpose similar to that stated in Tolson's petition—namely, the production of metallic lustre on cloth—to have copies prematurely furnished them of Tolson's provisional specification, in order

to see whether his alleged invention was the same as theirs.

Mr. Webster moved, and Mr. Hindmarch opposed.

The Lord Chancellor refused the application with costs, stating that sometimes it might be very detrimental to an inventor to have his specification seen prematurely, and thereby published to the world before the time intended.

We are surprised to find such an application as this made—an application which could not be complied with, except by a direct infringement of both the spirit and the letter of the law.

NEWLY-DISCOVERED GAS-COAL.

A formidable rival to the well-known Boghead cannel has just been discovered in the United States, which will, probably, diminish the demand for English cannel coal in America, and have some effect upon the future price of that article at home. The newly-discovered deposit is situate near the banks of the Ohio, in Breckenridge County, State of Kentucky. A sample sent to this country produced at the rate of about 11,000 feet of gas per ton, of a quality 15 per cent. superior to Boghead cannel gas, one cubic foot per hour giving a light equal to nearly ten standard sperm candles.—*Journal of Gas Lighting*.

EXTENSION OF THE SMOKE ACT.

In the House of Lords on Friday, May 2, Lord Redesdale moved the first reading of a bill to amend the existing Metropolitan Smoke Act, by repealing the exemption of glasshouses and potteries from its operation.

Lord Ravensworth suggested that a general measure referring to the whole community, and not confined to the Metropolis, should be introduced.

The bill was read a first time. It was read a second time on Thursday last.

WOODCOCK AND GARDNER'S PATENT FURNACES.

To the Editor of the Mechanics' Magazine.

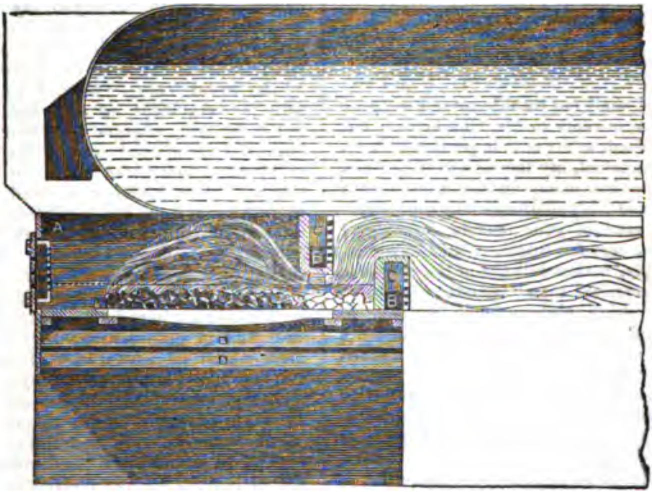
Sir,—My letter respecting the above in your impression of April 19th, has drawn forth observations from Mr. Gardner, Mr. C. W. Williams, and J. S. S., respectively. I will answer each in succession. Mr. Gardner's letter is simply an attempt to mystify, by the use of misapplied terms; he says, "the object of each patent is undoubtedly the same, but the means to the end are very different;" that is, the object of both is, to cause the products of combustion to impinge upon the incandescent fuel on the fire bars, and afterwards to be supplied with a proper quantity of atmospheric air; this corresponds with both our specifications.

The "means to the end," consist, in each case, of a hanging bridge placed nearer to the door than the ordinary bridge, the requisite supply of air being afterwards given. Wherein then lies the difference? It is true that Mr. Gardner places both his bridges at an angle, instead of perpendicularly, and so, occasionally, do I. Mr. Gardner seriously affirms that he has "no hanging bridge, with or without the air supply," as I have. In the "*cut*" he refers to, a hanging bridge is visible, but perhaps the remark "such as Mr. W.'s" is a saving clause. Mr. Gardner has also the ordinary bridge, which is a multi-divisional air bridge, for although dignified by the term "diaphragm," it is none the less a bridge; yet Mr. Gardner affirms, in respect of it, that "he has no hollow bridge with or without air," and in this case without the saving clause, "such as Mr. W." He claims the right of placing this bridge in a perpendicular position, and also of making it with one division only, and in the drawing sent with his specification, it appears to be "Parke's split bridge" only. "Yet," says Mr. Gardner, "I have no hollow bridge with or without air."

But, had Mr. Gardner found other means than mine to the same end, it would not avail him, since he claims the exclusive right of using any means which, "to all intents and purposes," bring about the same object. In fact, Mr. Gardner's letter clearly proves that both patents are for doing the same thing, and in the same way. As to my own claim, he who makes two screws do what two screws have never done before, is justly entitled to a patent for the same. I have made use of various appliances, no one of which is now the subject of a patent, and by a certain combination of these appliances, have accomplished that which had not before been achieved, and on this combination I rest a just claim, which no one can upset, and which Mr. Gardner shall not be permitted to filch from me. Mr. Gardner presumes that I had seen the superiority and success of his colourable alterations. My experience has extended to two of his furnaces only. Against one a complaint was made in the police-court, and the excuse given for the quantity of smoke which it emitted, was that its "diaphragm" was out of order. The other had done one week's work only, and was then useless without having a new inside altogether, its "diaphragm" being burnt out. At about the period of these two occurrences I was favoured with a letter from Mr. Gardner, stating that he intended to give a lecture on the "Smoke Question," and if I would send him Models, he should be happy to introduce my plans to the public.

Another communication was forwarded by "PROFESSOR Gardner" to a Mr. ——, who had been unfortunate enough to use Mr. Gardner's apparatus, requesting that no one might be allowed to see this apparatus without a written order from the "*Professor*." Why this concealment? and why should Mr. Gardner be anxious to introduce an opponent's plans? The truth seemed to be that those patented plans had been appropriated already, and the precise details were required to follow. The accompanying wood engraving illustrates them. I should really feel indebted to any practical man, who would carefully examine Mr. Gardner's "*cut*," and inform me by what possible contrivance such a furnace could be made to do a single hour's work.

To Mr. C. W. Williams I am obliged,



for the remark that the two patents are the same. An engineer of his intelligence and experience would see this at a glance, but I must remind Mr. Williams, that on the occasion of our late correspondence, in your Journal, I mentioned that a perforated bridge for the admission of air had been in use for the last thirty years in London, and Mr. Gardner has shown that I make no claim to it. Mr. Williams contends for cold air to be supplied to the gases—I for cold air to the fuel, but hot air to the gases—a sufficiently marked distinction without the deflecting arrangement, which Mr. Williams never used, and does not approve of. I may have more to remark upon the "Prize Essay" alluded to through another channel. It is impossible to get rid of all smoke in an ordinary furnace, without causing the gases to impinge upon the incandescent fuel before they receive their full supply of oxygen; this arises not merely from any increase of heat given to the gases, although this good effect, contrary to Mr. Williams' statement, is inevitable, for the smoke formed in the body of the furnace by *imperfect combustion* is not in a state of incandescence until the instant of its contact with the heated carbon on the fire bars, but from other causes. These are obviated by the process I use, of which the real object is that the carbonic acid gas formed in the furnace and which would otherwise carry with it floating particles of carbon and thus give off visible smoke, should by contact with the incandescent coke be converted into carbonic oxide. This gas is readily inflammable, and, upon receiving its proper supply of oxygen, is again the subject of combustion. Thus, carbonic acid is again formed, but this time at a point in the flues, where no other gases are left to decompose, and no visible carbon given off to colour it.

Having answered Mr. Williams' questions, I may be allowed to ask that gentleman why he corrected my words, with the remark, "he should with more correctness have said, the products of NON-combustion." *What are the products of* NON-*combustion?* Again, how does Mr. Williams prove that the gases, after having left the source of their generation, and having been in contact with the boiler, are at the heat of incandescence, and if they are so, how is it that the carbon is developed in the furnace in the shape of smoke?

To J. S. S., I have only to say, that the

patent he alludes to has nothing in common with mine, as I do not pass the gases through heated passages of fire-brick or other material, and I give the requisite supply of air *after* — not *before* — contact with the incandescent fuel. In the latter case it would somewhat resemble supplying fuel to an extinct flame; in the former, to one in full vigour.

I am, Sir, yours, &c.,
Wm. Woodcock.

12, Bishopsgate-street Within,
April 28, 1856.

MECHANICAL LOCOMOTION.

To the Editor of the Mechanics' Magazine.

Sir,—I shall not trouble myself to spend much time in reply to Mr. Cheverton's last sally; indeed, as far as that gentleman himself is concerned, my labour would be fruitless, as he has made up his mind that I shall "evade" his challenge "by sophistry." For the sake of your readers, however, I shall say a very few words. Mr. Cheverton, in his reply, makes full use of the privilege which "practical men" arrogate to themselves, of using philosophical language in the loosest possible style, and of blowing hot and cold in the same breath. When you have obliged them to confess a truth, they find means almost in the next sentence to contradict themselves. I am not therefore surprised to find that Mr. Cheverton can find individual passages in his letters, which seem to be in entire contradiction of what I have conceived to be his real meaning. I will leave the unprejudiced portion of your readers to read his letter which appeared in your number of April 12th, and my reply to it, and to form their own judgment as to whether I have replied to its *spirit* or not.

In the first pair of passages which he brings into juxta-position, in order to prove that I have not used good faith towards him, I cannot see any such contrariety of meaning as would make out his case. He speaks of "mathematical conceptions in the *abstract*, and those *concrete* views," &c., and I, in common, I believe, with the bulk of your readers, interpret these "conceptions" to be of force—the matter in dispute—which, indeed, the general scope of his observations seems to warrant.

With regard to the second pair of passages, the contrast ought to be as follows:

"It sounds like a solecism to speak of three *forces* in equilibrium, in connection with power, fulcrum, and work. B. C.	"However much it may *appear* a solecism to Mr. Cheverton, there are undoubtedly *three* forces applied to an oar, and to a lever of any kind." W.

It would seem the only difference between us here, lies in the use of the word "sound" by Mr. Cheverton, and "appear" by me; of this, I willingly give him the full benefit.

With regard to the third pair, I can only say that Mr. Cheverton does consider, or rather *did* consider, the equation, in its application at least, ridiculous, as he introduces a clever conclusion of Paddy's, in illustration. Long before that passage occurs which is supposed to point out particularly in what the fallacy of my statement lies, Mr. Cheverton, after quoting my words with respect to the ratio of the propelling force on the rowlock to the power exerted by the rower, says, "Now, I oppose this with the argument *ad absurdum*." How can I be truly charged with want of good faith, if I understood this of the equation in which I calculated the ratio in question? I must confess that until light was thrown upon it in his last letter, I did not understand the passage which he now adduces for my discomfiture. Mr. Cheverton may make himself quite easy with regard to the very "cogent motive" which he thinks must have induced me "to attribute to him opinions the very reverse of those which he advanced." I can assure him that I have not perceived myself to be in error, nor has anything he has advanced, in the slightest degree tended to produce this result; and the very last thing I should wish to do, would be to "endeavour to slide sinuously from my own position into his!"

The truth simply is, that it never occurred to me that fulcrums could be considered as possessing such wonderful properties as it now appears Mr. Cheverton invests them with. Had I possessed this clue, I might have found my way more cleverly than I did, through the mazes of Mr. Cheverton's explanations. I perceived, indeed, that there was some virtue in the symbol F, as the refutation of the error—I must not now say of my equation, but of my application of it—mainly consisted in its being made to appear that I made $R=F$; and then when $a+b$ becomes infinite, $P=R$, and therefore $P=F$.

I always had a suspicion that "practical men," from their great anxiety to discover the situation of a "fulcrum," must attribute some great virtue to it; of this I am now convinced.

The fact is, that Mr. Cheverton entirely misunderstood the scope of my first letter, in which I proved that the ratio of any *two* of the three forces, applied to an *oar*, can be obtained in several different ways. I now discover that his real objection is to the consideration of the "row-lock," as the point at which the propelling force is applied. He looks at all levers as having a

power applied to them at some definite point; a resistance offered at some other definite point; and a point—the fulcrum—about which the lever turns.

The *useful effect* or resistance to be overcome cannot be applied, of course, at the same point as that at which the power is exerted; and therefore, according to Mr. Cheverton, it must be at the other end of the oar, viz., the part of the blade immersed. But what is the *useful effect* which is to be produced? Surely to propel the boat. How in the name of common sense can a *force* or useful effect applied in the water *outside* the boat be *directly* effective in propelling the boat? It must be transmitted to the boat itself by some means or other, and, of course, by some part of the oar which is in contact with the boat on which the useful effect is to be produced. No point answers this condition except that in contact with the row-lock. The object of the rower is not to *disturb the water* with the blade of his oar; this he does only to enable him to exert another effect in the propulsion of the boat. According to the usually-received principles of mechanics, the point of application of the *useful effect* must have the same motion (in the case of a boat) as the boat itself has. No one will maintain that the flat of the blade immersed has the same motion as the boat. It has a motion compounded of that of the boat and that which is produced by the motion of the hand of the rower at the other end.

If we should accept Mr. Cheverton's explanation, we should have this anomaly—that the "useful effect" is exerted at a point at a considerable distance from the body on which this useful effect is produced.

This, indeed, does appear a "solecism!"

But the point of the oar in contact with the row-lock has the advantage of being in immediate connection with the "useful effect," and has the same motion as the boat moved. For these reasons I apprehend there cannot be a question but that, supposing the motion of the oar and boat uniform, the point of the oar in contact with the water momentarily is rightly looked upon as the *fulcrum* (in Mr. Cheverton's sense of the word), and the pressure on the row-lock exerts the "useful effect."

Mr. Cheverton does not show the slightest acquaintance with the term "work," used in its technical (and that too "practical") signification, as measuring a certain effect of a force. He evidently attaches no definite or correct idea to my words, which seem to him a truism—"the work developed by the power being *nil*, the work done in propelling the boat is *nil* also;" for he thinks that he has expressed the same idea in the remark—"We see that in a certain position of the hand of the rower, the exertion of the strain is useless." I shall not further enlarge on this topic, as I am not concerned to write a treatise on practical mechanics; and it seems that the exhibition of symbols only tends to confirm my present opponents in the idea that I *can* know nothing about these questions because I *do* know something of mathematics! However, those among your readers who are at all acquainted with "practical mechanics," will understand me well enough.

Your readers will now be in a situation to judge who has committed Hibernian blunders in this discussion. As regards the tone which I thought right to adopt in my last letter, I believe it to have been completely justified by the ignorance with which an absurd distinction was sought to be set up between mathematical and practical "conceptions" of mechanical questions—an absurdity which, in my opinion, lies at the root of that vast amount of self-sufficiency and disparagement of scientific knowledge which so unluckily distinguishes many of our "practical mechanicians;" and I thought that the uncalled-for and unreasonable note of triumph over a foe whom Mr. Cheverton fondly believed to be lying prostrate under his doughty blows deserved some castigation. That he has felt that castigation severely, is evident from the whole tenor of his last letter, and more especially from the inconsistencies in which (in true consistence with himself, however) he indulges. Thus he more than hints that I have no title to be considered more than a quasi-mathematician, and, a few lines below, expresses a conviction "that I am a consummate mathematician."

It matters very little who or what I am. I have never endeavoured to further the cause I advocate by the *authority of a name*, or any authority but that of reason, and I am therefore well content to remain unknown. I hope, however, that we have now heard the last of the preposterous pretensions of "practical men" to be considered as judges in the *theory* of their art, simply because they are engaged in carrying out its practical details, and to undervalue the labours of the mathematician who has quite as much information at his command as the "practical man," and the skill to turn it to good account, to boot, *because* he is not an actual manipulator. The whole question raised on the present occasion has been the *theory* of certain machines. And my opponents have signally failed in showing that they have, "as practical men," any claim to be considered as exclusive judges on the question. On the contrary, they have shown that they themselves share fully in

the confusion and inadequacy of ideas on this important question, which at the commencement they laid to the charge of another section of their own community.

I have already trespassed so much on your valuable space, that I am obliged to omit many remarks which suggest themselves to my mind, in reference to this subject. I may merely say, that I was quite right in observing that Mr. Cheverton "*unconsciously furnished the correct answer*" to his strictures on my equation, for, although he allows that, in the case of the hand of the rower slipping up to the rowlock, the oar ceases to be a lever, he cannot, apparently, discern that, under such circumstances, the oar must *necessarily* cease to be an instrument of propulsion, wherever the fulcrum be supposed to be situated. I might very easily show, but for the fear of exhibiting symbols to the horror of my opponents, that as the hand of the rower moves towards the fulcrum, the force applied by his hand has necessarily a diminishing effect in moving the boat, although the pressure on the rowlock is continually increasing, and that ultimately, as we have seen, when these two forces are exactly equal, this useful effect is reduced to zero; but as this would require an exposition of what is meant by "work," and as instead of getting thanks for the instruction so conveyed (and needful enough) I should be told that I am stating "truisms" or "well-known propositions," I will refrain.

One short word in conclusion, in reply to "C."'s letter, in your number for April 26th. He will find the greater portion of his remarks sufficiently answered by anticipation in my letter published in the preceding number. I may be permitted, however, to remark, that it is amusing as well as instructive to see how I fell under the ban of one of my opponents, for taking note of too many forces, and under that of the other, for taking note of too few; and to observe the very ingenious discovery of "C.," which would probably surprise no one more than Mr. Cheverton himself, that that gentleman "deals me heavy blows" because "I do not take proper account of the reaction of the forces employed."

The error into which my ingenious opponents have fallen, is that of looking for levers and fulcrums, where levers and fulcrums do not properly exist. The propulsion of a locomotive has, as I have amply shown, no analogy whatever to that by means of a lever.

I must demur to "C."'s statement, that "all machines consist of a series of levers and fulcrums." That levers and fulcrums (in that case, well defined, unmistakable fulcrums, or *points fixed, relating to the machine*, about which the levers move freely) do enter into the composition of many machines, I do not deny, and of course when they do occur, the man skilled in mechanical philosophy has no difficulty in dealing with them.

But many parts of machines are not in any sense levers; as, for example, the piston-rod and connecting-rod in steam-engines, and egregious mistakes would result from so treating them.

That, however, a locomotive and its attached train, cannot be treated, as regards the principal motion, as combinations of levers of this kind, is evident from the fact that a dispute has been raised in your pages, as to what is the proper place of this fulcrum, and which has received most contradictory answers. All possible questions with regard to the powers exerted on machines, are *fully* treated of by mechanical philosophers, and their effects traced by them all through *their course*. It is mainly for the benefit of "mechanicians" that the simple, though true relations which "C." finds so inadequate have received so much illustration. To "C.'s" heresies with respect to reaction, it is not worth while to make further reply, as I see no indication of any one adopting or even understanding them. Regretting to have run to a much greater length in this reply than I could have wished.

I am, Sir, yours, &c.,

W.

London, May 6, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

DAINES, J. B. *An improved mode of treating surfaces of stone, plaster, and cement, for the preservation of the same from decay.* Patent dated August 12, 1854. (No. 1765.)

This invention consists in coating surfaces of stone, plaster, and cement with a solution formed of 1 part (by weight) of sublimed sulphur and 8 of linseed or other oil. The mixture is placed in an earthen vessel and heated in a sand bath to from 226° to 278° Fahr., when the sulphur dissolves. The solution is laid on with a brush.

*** The filing of this specification has been delayed for more than a year in consequence of opposition.

LOWE, J. *Improved apparatus to be employed in place of paddle wheels, or ordinary steam propellers for propelling vessels.* Patent dated June 16, 1855. (No. 1376.)

This invention consists—1. In dividing each of the blades or vanes of screw propellers into two or more parts and placing them in pairs or sets in or near a line which

passes diagonally across the boss. 2. In making the first of the blades slightly convex or bowed, with the front edges chamfered off, and the next slightly concave in the direction of its length. 3. In the employment of a propeller boss of an elliptic form longitudinally. 4. In certain means of connecting the blades to the bosses.

*** We shall probably publish an illustrated description of the above invention shortly. The specification of the patent was not filed until the 7th of April, the time for filing it having been extended by the Lord Chancellor, as in the case of the preceding one.

HARCOURT, H. J. *Certain improvements in bell-cranks and other parts of bell-furniture.* Patent dated September 24, 1855. (No. 2131.)

These improvements consist in cutting out such parts (by means of a fly press and press tools) in the ordinary way, from sheet iron, brass, or other metal, then piercing them out where required, and raising them into any desired form, as a means of increasing their strength, and giving them a more substantial appearance. With respect to the driving irons to which the cranks or flies are frequently attached, it is proposed to cut them from sheet iron, as large cut nails are made. The improvements also relate to bell levels, with which, by means of an additional lever, the inventor obtains a direct action, without the use of a crank chain, &c. Also, to the roses or front ornaments used in connection with bell levers, pulls, quadrants, &c. It is proposed to make them with suitable metal shells, and to cover them with embossed velvet, leather, or figured silk, satin, &c. To house bells, a particular kind of chain is applied (in lieu of the common crank chain), viz., the chain which has been used (when of an ornamental character) for suspending pictures, gas chandeliers, &c.

MANBY, C., and W. PIPER. *Improvements in machinery for cutting stone.* (A communication.) Patent dated September 24, 1855. (No. 2132.)

A description of this invention was given on page 419 of our last Number.

MUSTO, J., and F. BEAR. *Improvements in machinery for the manufacture of tobacco.* Patent dated September 24, 1855. (No. 2134.)

The principal feature in these improvements consists in certain mechanism, by the action of which the ribs or stems are finely shredded, instead of being crushed only, as heretofore. Upon the periphery of a roller, and in the direction of the axis thereof, are fixed, at equal distances asunder, serrated pieces of metal or points. The roller thus formed is placed in a frame, in which it is caused to revolve by gearing or otherwise. There are also rollers for feeding and guiding the ribs or stems over the serrated roller or points, which, revolving at a quicker speed than the feeding rollers, cause the ribs or stems to be torn into shreds.

NEWTON, A. V. *An improved mode of casting solid and hollow articles in metal.* (A communication.) Patent dated September 24, 1855. (No. 2135.)

Claim.—Retaining for a suitable time (by the application of local heat, however produced) a portion or portions of the metal forming castings, of the nature above indicated (that is, castings partaking of an annular or cylindrical form, such as fly-wheels and cannon), in a fused or molten state, for the purpose of providing for the natural contraction of the metal on cooling without detriment to the structural quality of the casting, and making the supply of metal to the mould continuous, and consequent on the contraction of the cast metal.

WRIGHT, W., and J. WRIGHT. *Improvements in machinery for crushing grain.* Patent dated September 25, 1855. (No. 2138.)

This invention consists in an improved combination of revolving rollers and fixed plates, between which the grain is caused to pass, for the purpose of crushing it sufficiently at one operation.

WHITWORTH, C. F. *Improvements in signals used on railways, and in parts of apparatus in connection therewith.* Patent dated September 25, 1855. (No. 2140.)

These improvements apply—1. To railway night signals, when the signal is effected by shifting coloured glasses, and relate (when the signal glasses employed would otherwise be placed in frames outside the lamps or lanterns capable of turning on centres of motion) to placing such frames within the lamps or lanterns, free from dirt or other matter, and in a better position for receiving the rays of light, and imparting the distinctive colours; also to placing each glass in a separate frame, &c. They relate —2. To means of effecting the connections to the ends of compound wires, employed for tractive or retentive purposes, and consist in passing the end of such compound wire a short distance through a hole, sufficiently large to admit it within a shackle or other instrument to which it is to be connected; the end of the wire is then also passed through a small metal nut, over which the projecting ends of the wires are severally turned down and soldered, whilst the wire and nut are held in such a position as to permit the descent of some of the solder between the screw grooves of the nut and the folds of the wire. They relate—3. To forming guide pulleys for small chains, or for wire used in operating with signals,

and consist in giving the wheels a sufficient boss, and inserting or casting a circle of brass near the centre of each of the sides of the frame or carriage, for bearing the pulley wheel.

LAPORTE, E. *Certain improvements in the manufacture of candles.* Patent dated September 25, 1855. (No. 2141.)

This invention consists—1. In the employment of a wick composed of a great many threads, woven or plaited, or otherwise held together, or of a number of small wicks united. 2. In the employment of a jacket or case round the moulds capable of being heated from 112° to 132° by gas, steam, or other heating medium. 3. In a general process followed to manufacture a candle composed wholly of vegetable wax, or having vegetable wax for its base.

ENSOR, F. R. *Improvements in bobbinnet or twist-lace machines.* Patent dated September 25, 1855. (No. 2142.)

A description of this invention is given on page 420 of our last Number.

HUGUENIN, G. *Certain improvements in watches and other timekeepers.* Patent dated September 26, 1855. (No. 2144.)

This invention, which has reference to mechanism for winding up and setting the hands of watches, &c., is carried into effect as follows:—The pendant is caused to be traversed by a pinion, the spindle of which is made to terminate in a knob, for the convenience of being readily turned by the hand when required; and a wheel furnished with a double set of teeth is adjusted, one set taking into and receiving motion from the pinion, whilst the other set is made to act upon the barrel wheel, through the intervention of a coupling wheel, so as to wind up the watch; or it may be brought to bear upon the minute wheel, through similar intervening mechanism.

NORBURY, J. *Certain improvements in machinery or apparatus applicable to hydraulic presses.* Patent dated September 26, 1855. (No. 2146.)

This invention applies to hydraulic presses worked by steam power, and the improvements are for starting and stopping the "power pumps" used for working such presses, and to enable such processes to be effected from any part of a building in which the presses may be employed, without signalling, as at present.

Claims.—1. The method of imparting motion to "power pumps" by means of friction exerted between a flange upon the driving or fly-wheel, and a bowl or roller in connection with the pump. 2. An arrangement and combination of rods, chains, and bell-crank levers, for governing the friction bowl. 3. The application of fingers and dial-plates, in connection with a described arrangement throughout the building.

BOUCHET, F. *An improved mechanical arrangement for elevating or lowering, and moving forward or backward, heavy or submerged bodies.* Patent dated September 26, 1855. (No. 2147.)

Two capstans are made use of, one of them at each side of the canal or river. They are connected by a cable or rope, attached by suitable hooks to the top of the capstans, and also with counter-weights. On this cable a carriage is made to move by means of suitable ropes or cables (guided by a pulley) by a mechanical arrangement at the lower part of the capstans. For raising submerged bodies two vessels are used, which vessels are connected by means of cables, the ends of which are fastened to the ships' masts, and the capstans are dispensed with. A diving-bell may carry down the work-people, which bell (together with a box for implements, &c.) is moved by the above-described mechanism.

NASMYTH, J. *Improvements in the modes of obtaining motive power by a rotary or circular movement, and of applying it.* Patent dated September 26, 1855. (No. 2148.)

This invention consists in placing a piston within a circular or annular tube, in which there is an annular slit or opening, through which opening an arm fixed to the piston projects, and is made to act against another arm projecting from a vertical or main shaft, from which shaft motion may be transmitted to machinery, by means of bands, pulleys, or toothed gearing, in the usual way; the arm projecting from the piston before mentioned passes through a circular steam-tight valve, that covers the annular slit or opening, and which valve is caused to travel with the piston, as the latter performs its circular course in the annular tube.

HUGHES, H. *Improvements in the means of compensating for the wear of machinery subject to rectilinear motion.* Patent dated September 27, 1855. (No. 2151.)

A description of this invention is given in page 439 of this Number.

FONTAINEMOREAU, P. A. L. DE. *Improvements in forging iron.* (A communication.) Patent dated September 27, 1855. (No. 2152.)

The invention consists in hammering and welding iron in the interior of the furnace, to prevent the cooling effect which takes place in the ordinary mode.

GUILBERT, A. E., and C. L. GUILLEMERE. *A new system of bridle for leading and overruling fiery horses.* Patent dated September 27, 1855. (No. 2153.)

In this invention two goggles are adjusted to certain rods connected with the bridle, and also two small bars that bear at their extreme ends small plates or buffers. Should the animal get fiery and run away,

it will suffice to pull up a thong which is attached to certain levers, and the rods will be thereby caused to apply the goggles and plates, or buffers, the former pressing on the eyes, and the latter on the nostrils of the animal.

ATKINSON, M., and B. RIDGE. *Improvements in the construction and setting of steam boilers for economising fuel, and for rendering the same applicable not only to the generation of steam, but also to ventilation, the distillation of water for ships' use, and the distribution of heat for general purposes.* Patent dated September 27, 1855. (No. 2154.)

The principal features of these improvements consist—1. In so constructing a boiler as that its heat is more concentrated, from the action of a small fire, and from other radiating surfaces in a given space, than in ordinary boilers. 2. In occupying a smaller space in proportion to the power than other boilers. 3. In a mode of setting or combining the fire-bars with the boiler, by which the necessity for banking the fire is dispensed with, and the cooling of the boiler prevented, or sufficiently protracted to admit of the fire being put out, instead of banked as heretofore. 4. In so constructing and arranging the boiler, and the pedestal or base on which it stands, that the atmospheric air shall pass through its centre, between two water chambers, and, becoming heated, pass off through an appropriate outlet in the form of heated oxygen, free from carbon, and well adapted for warming and ventilation. 5. In simplifying the construction of the boiler.

POIGNAND, F. X. *Improvements in the manufacture of wedges and keys.* (A communication.) Patent dated September 27, 1855. (No. 2155.)

By this invention such wedges and kegs are made entirely by machinery, and the operation of first tracing them out upon the wood is dispensed with. Planks are first sawn of the required lengths by a circular saw; they are then fixed in frames upon a revolving platform, where they are finished by a planing machine, consisting of a frame which is fitted with two sets of plane irons placed in opposite directions; the planes are moved to and fro by a connecting-rod attached to an eccentric upon the shaft of a fly-wheel, or to a crank.

THÉRY, C. V. *A new preparation of coffee.* Patent dated September 27, 1855. (No. 2157.)

The preparation consists in rolling coffee (previously roasted and ground) together with some fatty substance and sugar, until it acquires a pasty consistency, when it may be put in shapes or moulds, as is done with chocolate; or it may be further treated by placing the paste in a vessel, which is put into another containing water, and leaving it over a fire to simmer, adding water, coffee, and sugar, till it forms into a semi-liquid sweetmeat.

GRAY, W. D. *An apparatus or instrument for showing the course or direction and distance run by a ship at sea.* Patent dated September 28, 1855. (No. 2161.)

A description of this invention will shortly be given.

PITMAN, J. T. *An improved screw-wrench.* (A communication.) Patent dated September 28, 1855. (No. 2162.)

This invention consists in constructing a screw-wrench with a moveable jaw, which has a collar or eye with a larger aperture than the bar on which it slides, and which is operated by a suitably-arranged spring or lever.

JOHNSON, R. L. *Improvements in the manufacture of gas for illumination from peat or other substances, and in the apparatus employed in such manufacture.* Patent dated September 28, 1855. (No. 2163.)

The object of these improvements is to decompose, more completely than heretofore, the peat or other substance employed to produce illuminating gas, and to convert into such gas some of the other matters evolved in the form of condensible volatile matter from the substance employed. A peculiar arrangement of apparatus is employed, consisting principally of a retort, in which are plates or rods, placed in such manner as to form horizontal shelves. Above the upper shelf are placed rods or plates, on which is placed charcoal or coke. On the bottom of the retort, and on the lower shelf or shelves, is placed the substance to be distilled. In front of the shelves, and extending downwards from the top rods or plates (which support the charcoal or coke) to the bottom of the retort, there is a movable stopper, to prevent the matter evolved from leaving the retort before passing through or over charcoal or coke. The shelves are not extended to the back or end of the retort, but a passage is there made by which the volatile and gaseous matter generated passes to, and comes in contact with, the charcoal or coke, by which contact the condensible volatile hydro-carbons are converted into permanent illuminating gas, and the water usually contained in the substances distilled is caused to be expelled or decomposed before it can act injuriously on the gaseous products. The patentee also maintains a higher and more equable temperature of the retort, which is often lowered by the usual mode of placing in it the substance to be distilled.

ROBEY, R., and G. L. SCOTT. *Improvements in locomotive and other boilers.* Patent dated September 28, 1855. (No. 2166.)

This invention consists in continuing the water space of a tubular boiler under the fire-box, so that the furnace may be surrounded on every side by water. Also, in forming a chamber at the upper part of the smoke-box, into which the exhaust steam is blown. The chamber is traversed by a pipe connecting the smoke-box with the chimney, and the steam blown into the exhaust chamber escapes into the chimney by the annular space between the pipe and the chimney.

GOOD, J. *Improvements in straw-shakers of thrashing-machines.* Patent dated September 28, 1855. (No. 2168.)

This invention consists in suspending or supporting the shaker bars or shaker boxes forming the straw-shaker, either alternately or otherwise at their opposite ends, and in giving motion to them by a cranked axle or axles applied to them at points intermediate of their points of support.

BARLOW, H. B. *Improvements in mules and other machines of the like nature for spinning and doubling cotton and other fibrous materials.* (A communication.) Patent dated September 29, 1855. (No. 2170.)

This invention consists—1. In the application of a friction plate instead of a friction cone, for giving motion to the parts requisite for backing off, or for unwinding the yarn off the spindles. 2. In a mode of applying a friction box for giving motion to the parts by which the carriage is moved towards the roller beam. 3. In an arrangement of a lever, in combination with a chain and scroll, by means whereof the varying speeds are produced during the pulling up of the carriage. 4. In a mode of constructing the radial arm, and in connecting the chain by which that arm is raised and lowered to a scroll, which scroll imparts the requisite speed to the radial arm. 5. In a mode of applying a spring of vulcanised India-rubber for rewinding the winding on chain on the barrel. 6. In the application of a fixed friction plate for bringing the winding on click in or out of gear with the ratchet wheel, during the going in and going out of the carriage. 7. In a combination of parts for connecting the copping motion to the faller and counter faller wires. 8. In the application of a weighted tumbler lever for moving the strap guide by which the driving strap is guided to the driving and loose pulleys. 9. In the application of wire ropes for taking the carriage in and out, and to other parts of mules, &c., where they may be applied in place of chains, cords, or bands. 10. In dispensing with the carriage square, and in an improved mode of coupling the carriages of double mules. 11. In an arrangement of parts forming the improved mule. 12. In the application of a screw combined with a rack for moving the carriage in and out, the screw being worked by two friction boxes or wheels revolving at different velocities. 13. In dispensing with the usual cam shaft, and parts connected therewith, and in substituting an improved apparatus by which the motions of the machine are changed.

CHADWICK, D., H. FROST, G. HANSON, and J. CHADWICK. *Improvements in apparatus for measuring water and other fluids and gas, applicable also as a motive power engine.* Patent dated September 29, 1855. (No. 2173.)

This invention will be fully described hereafter.

BEATTIE, J. *Improvements in the construction of railway wheels and axles.* Patent dated September 29, 1855. (No. 2175.)

A description of this invention will shortly be given.

ILLINGWORTH, W. *Certain improvements in printing earthenware, china, and other ceramic manufactures.* Patent dated October 1, 1855. (No. 2179.)

Claim.—The substitution or use of a preparation of saccharine matter, in lieu or in place of oil, &c. (as hitherto employed), in the pigment or conveying medium of colour, in printing earthenware, china, or other ceramic manufactures.

RADCLIFFE, C. *Improvements in apparatus for moistening or damping woollen or other textile fabrics for finishing.* Patent dated October 1, 1855. (No. 2180.)

These improvements constitute an extension of a former patent, dated 29th August, 1855, and consist (in addition to the revolving brush or brushes therein specified) in the employment of a perforated pipe or vessel, or a perforated cylinder or hollow roller capable of revolving, the said vessel or roller being supplied with water to the interior, which is forced through the perforations by hydraulic or other pressure.

BELLFORD, A. E. L. *Improvements in ventilating hats, or other coverings for the head.* (A communication.) Patent dated October 1, 1855. (No. 2181.)

This invention consists—1. In constructing the hat to open at its sides at some distance from the crown, thus forming the body in two parts, one of which is connected permanently with the crown, and the other with the lower portion of the hat, so that the crown portion may be adjusted to form an open or close communication with the lower or front portion. It consists—2. In attaching to either of such divided portions, a strip of gimp, or any other reticulated or perforated material, in such a manner as to form a telescopic fitting to the body at its division, or to serve as a guide to the moveable portion.

KEMPE, W. *An improvement in machi-*

nery for raising the pile on woollen and other cloths or fabrics. Patent dated October 1, 1855. (No. 2184.)

This improvement consists in so arranging the bed or surface on which the fabric is moved, that it may, in place of being fixed, be moved endwise, and be adjusted to the varying widths of fabrics introduced, the two selvages in each case being protected from the action of the raising process.

AUGIER, J. F. V. *An improved apparatus for extracting the aroma from plants and flowers.* Patent dated October 1, 1855. (No. 2186.)

This invention consists of an apparatus for making tea, &c. The colander or strainer is of metal or porcelain, with small holes in its sides. It is supported by a flange, so that its bottom is slightly elevated above the bottom of the teapot. It is also provided with a moveable handle. There is an inner strainer, pierced all over with small holes, and provided with a fixed handle. Certain plates serve to keep the internal strainer at equal distance from the sides of the outer one, and small supports keep it from touching the bottom of it.

BAKER, G., and C. MILLER. *Improvements in the construction of register stoves.* Patent dated October 1, 1855. (No. 2187.)

These improvements relate to a mode of arranging parts in connection with register stoves, in order that the draft to such may, when desired, be readily increased, and consist in the application of a pair of iron plates, arranged to swing from the cheeks to the front of the stove, with one or two sliding plates behind to slide from one of the front plates to meet the other.

UCHATIUS, F. *An improvement in the process of manufacturing cast steel.* Patent dated October 1, 1855. (No. 2189.)

A description of this invention is given on page 441 of this Number.

HOPE, G. C. *An improved method of producing figures, patterns, or designs upon textile fabrics for the purposes of needlework.* Patent dated October 1, 1855. (No. 2190.)

A description of this invention is given on page 441 of this Number.

MUSGRAVE, J. R., R. MUSGRAVE, and J. MUSGRAVE. *Improvements in stoves for cooking and heating.* Patent dated October 1, 1855. (No. 2191.)

This invention comprises a method of cutting off the air from the lower part of the cooking fire by means of doors; an improved form of boiler; an improvement in slow-combustion stoves, which has connection with a former patent dated 16th November, 1853, and which consists in the attachment of broad projecting ribs to solid plates forming the body of the stove; and an improved method of ornamenting the outer surface of stoves.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

HUDSON, G. R. *An improved coffee-pot.* (A communication.) Application dated September 24, 1855. (No. 2133.)

This invention relates to a mode of constructing that part of a coffee-pot employed for effecting the clarifying of the decoction. In using this coffee-pot, the operator first removes a lid and piston, and then puts the coffee into the pot, and pours in boiling water, nearly filling the pot; he then replaces the piston and lid, and after a sufficient time, he gently presses the piston down, and thus forces the liquid through a flannel or other filtering material, leaving the more solid particles at the bottom of the coffee-pot; these can then be removed, and the pot cleansed.

SIMMONDS, G. *Improvements in the construction of bedsteads.* Application dated September 24, 1855. (No. 2136.)

The chief object of this invention is so to construct bedsteads as to afford no harbour for dirt or vermin. Wood pillars or posts are employed to carry a metal frame. In these posts are formed vertical slots, at right angles to each other, to receive thin plates of iron, which lock into each other, or are otherwise fastened together. The ends of these plates project from the pillars to form bearings for the iron bars which constitute the bedstead frame. To the underside of the ends of the bars a loop or hasp is formed to receive the ends of the plates which project from the pillars, and when the several parts are fitted to the pillars, lateral holes are bored through the ends of the bars and the projecting ends of the bearing plates, and these holes are tapped to receive thumb-screws, which hold the several parts firmly together.

GARDNER, J. L. *Improvements in the manufacture, form, and mode of attaching buttons.* Application dated September 25, 1855. (No. 2137.)

The object in view is to make a button, so that the shank shall, of itself, be capable of forming the attachment for binding the button to the fabric upon which it is to be used; that is, that it shall not require any sewing or binding substance to affix it. The buttons are formed so as to have the same shape of head as now; but in place of the present shanks, a shank similar in form and principle to the well-known "eye or eyelet hole" is formed.

CLIVE, J. C. *Improvements in photography.* Application dated September 25, 1855. (No. 2139.)

This invention relates to collodion positives, and consists in taking the portrait or group on one side of a sheet of glass, and in then (after having removed from the glass the whole of the background) taking upon the other side of the sheet any scene which may be desired for a background; or the background is taken on a second sheet of glass and placed at the back of the first.

ROBERTS, J. *Improvements in the manufacture of cements.* Application dated September 25, 1855. (No. 2143.)

The object of this invention is to produce cement of various colours for purposes of decoration. The colours are prepared by grinding, and are then mixed with Portland or other cement. To ensure a thorough mixing the compound is passed once, twice, or more times through a fine sieve. To produce a jet black colour, lamp black is mixed with the cement, and to obtain certain tints of red and yellow, venetian red, and yellow ochre are employed.

CRANKSHAW, R. *Certain improvements it machinery or apparatus for sizing or otherwise preparing warps for weaving.* Application dated September 26, 1855. (No. 2145.)

These improvements consist in so arranging the machinery that where narrow warps (or those not of the ordinary full width) are required to be sized the inconvenience of the use of the ordinary beam may be avoided, and the labour in sizing economized, which improvements are accomplished—1. By dividing the warp into two, three, or more widths; and 2. By providing two or more warp beams in the sizing machine, which are to be actuated by suitable gearing, so that one beam may be caused to wind on whilst another is at rest, if required.

HILLES, M. W. *An improved construction of rack for window blinds.* Application dated September 26, 1855. (No. 2149.)

Instead of the rack teeth of rack pulleys being formed on the back plate of the rack for the spring to act against, they are formed on the inner face of the overlapping sides of the rack, and a pin or tooth is provided at each side of the pulley carriage, to take into the rack teeth, the contact between which will be preserved, by the spring affixed to the back of the pulley carriage bearing against the smooth back plate of the rack, and pressing the carriage forward.

NEWMAN, J. *Improvements in the manufacture of railway wheels.* Application dated September 27, 1855. (No. 2156.)

This invention refers to improvements in manufacturing the bosses of wrought iron, from a bloom or ball, or a strip of iron coiled into a lump, in either case taken direct from the furnace, and forged or pressed by dies into the form of a disc having a series of indentations, two of these discs being put together, one on each side of the wheel; the spokes fit into the cavities, and the whole is then welded together; or, the boss is made by forging or compression, and cut into a certain form, and placed in the centre of the wheel. A check piece (a plain disc of the same size) is placed on either side, and the whole is welded together.

NOTTIDGE, J. *Improvements in the manufacture of manure.* Application dated September 27, 1855. (No. 2158.)

This invention consists in dissolving, by means of a caustic alkali, (caustic soda mixed with water by preference) wool, hair, woollen rags, shoddy, and other waste products of wool, for the purpose of manure, and also in the combination of the solutions thus made with bones, burnt bones, coprolites, and other similar substances or products thereof.

DYKE, T. *Improvements in grass-cutting machines.* Application dated September 28, 1855. (No. 2159.)

This invention comprises a frame carrying angular-shaped cutting blades or teeth, attached to a longitudinal bar forming the front of the frames; each fixed cutter is intersected at its base by a cutter moveable on a pivot, and these are connected by arms and pivots with a suitable bar, worked from about its centre by an elongated arm of one cutter, jointed to a connecting rod and operated by a crank at its other extremity. The cutters are thereby kept parallel, and work simultaneously; they also cut on both sides with square edges.

THWAITES, J. H. B. *Improvements in the preservation of teeth and in the manufacture and application of artificial teeth.* Application dated September 28, 1855. (No. 2160.)

These improvements consist in the employment of aluminium for the purpose of stopping decayed teeth, and in the manufacture of artificial teeth or blocks, with the plates, pins, rivets, springs, or other attachments, either wholly or in part of aluminium.

THOMSON, E. D. *Improvements in generating heat in steam boiler furnaces.* Application dated September 28, 1855. (No. 2167).

The object of this invention is that steam may, after it has been used in the engine, be conducted through an apparatus heated by the furnace, and thereby be decomposed, and the hydrogen be conducted with atmospheric air into the furnace, so as to be burned, and thereby aid in generating heat. It is preferred to have copper tubes through the fire-box or furnace above the fire-bars. On the interior of these tubes are placed

loosely tubes of iron. The steam enters at one end of these tubes, and is decomposed by the heated iron therein, and the hydrogen from the interior is conducted by suitable nozzles or tubes into the upper part of the furnace.

MITCHELL, J. *Improvements in buffers and draw-springs used for railway and other purposes.* Application dated September 29, 1855. (No. 2171.)

This invention consists in arranging machines or cones so as to act on segmental pieces which are encircled by elastic hoops, the inclines or cones, or the segmental pieces and elastic hoops being attached to or formed on the buffer or draw bar.

HERAPATH, W. B. *Improvements in the manufacture of surgical instruments.* Application dated September 29, 1855. (No. 2172.)

These improvements consist in manufacturing such instruments of aluminium, or in coating them with it.

GEDGE, J. *Improvements in the manufacture of braid.* (A communication.) Application dated October 1, 1855. (No. 2176.)

The inventor proposes to use a loom for manufacturing braid. He takes three spindles, similar to those used in making stay-laces, but a little stronger, and with a pivot at their lower extremities; these spindles are furnished with bobbins carrying the material, and below a toothed wheel is fixed, and into this gear several smaller ones, at the side of the spindles. The whole being put in movement, as in lace looms, produces a rotary right and left movement in the spindles. The threads, having received the necessary twist singly, are united in the axle of the apparatus, from which they receive the final twist uniting them in one braid.

*** In consequence of opposition, the filing of No. 2169 has been delayed.

PROVISIONAL PROTECTIONS.

Dated April 2, 1856.

791. Francis Young, of Norwich, Norfolk. An improved two-wheeled open vehicle or carriage.

Dated April 9, 1856.

858. Richard Chrimes, of Rotherham, York, brass founder. Improvements in buffers and other springs for railway and other carriages.

Dated April 11, 1856.

866. Henry Henderson, of Glasgow, Lanark, N.B., plumber. Improvements in water closets.

870. Peter Armand Lecomte de Fontainemoreau, of South-street, London. An improved apparatus for measuring the speed of currents of air and water. A communication.

872. Robert Davis, of Oxford-street, Middlesex. Improvements in the construction of tobacco-pipe stems.

Dated April 12, 1856.

874. James Marsh, of Manchester, Lancashire, engineer. Improvements in the fusible plugs and furnaces of steam boilers.

876. Robert Stirling Newall, of Gateshead-upon-Tyne, Durham, telegraph engineer. Improvements in telegraphic insulators.

878. Francisco Nuibo y Pedros, of Rue de l'Echiquier, Paris. A new motive power.

Dated April 14, 1856.

880. Edwin Heywood, of Sutton, near Keighley, York, designer. Improvements in fixing apparatus for generating steam, whereby smoke will be prevented or consumed, and fuel economized.

882. Patrick Robertson, of Shawlands-hill, Renfrew, manufacturer. Improvements in power-loom weaving.

884. Robert Richardson, of Great George-street, Westminster, Middlesex. Improvements in railway switches.

886. Louis Pierre Coulon, of Rue de l'Echiquier, Paris. A new type-distributing and composing machine. A communication.

888. Joseph Barrans, of New-cross, Deptford, Kent. Improvements in constructing steam engines.

890. William Warren, of Northampton-park, gentleman, and Warren de la Rue, of Bunhill-row, manufacturer, Middlesex. An improvement in the manufacture of envelopes.

892. Leonard Kaberry, of Rochdale, Lancaster, manager, and Aaron Horsefield, of the same place, moulder. Improvements in moulding for casting certain parts of machinery, used in the preparation and spinning of cotton and other fibrous materials.

894. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved mode of constructing grate-bars. A communication from John Beal, Andrew D. Melick, and Theodore de Witt, of New York.

Dated April 15, 1856.

896. William Henry Olley, of Brabant-court, Philpot-lane, London, wine merchant. Taking photographic impressions or pictures of microscopic objects by reflection, such reflection being effected by the combined aid of the microscope and camera obscura and camera lucida or other reflectors that may be employed in place of the latter.

898. Thomas Jeffries, of Reading, Berks. Improvements in cooking-stoves.

902. William Fuller, of Jermyn-street, Middlesex, ice pail manufacturer. Improvements in ice pails.

Dated April 16, 1856.

904. Edwin Napoleon Norminton, of Charrington-street, St. Pancras, Middlesex. The manufacturing of railway grease for the cleansing and remanufacturing of old used dirty railway grease or greases, for the cleansing and remanufacturing of old dirty cotton waste, tow, or any textile fabric.

906. David Blair White, of Newcastle-upon-Tyne, doctor of medicine. An improvement or improvements in cylinder pistons or plungers.

908. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in fire-arms and powder flasks. A communication from Colonel Sam Colt.

910. John Henry Johnson, of Lincoln's-inn-fields, Middlesex. Improvements in cleansing and hulling grain and seeds, and in the machinery or apparatus employed therein. A communication from Charles Theodore Laborey, of Paris, mechanician.

912. William Little, of the Strand. Improvements in lamps for burning paraffine and bituminous oils or naphthas.

Dated April 17, 1856.

914. Charles Hulme, Samuel Ivers, and John Yardley, all of Farnworth, Lancaster, mechanics.

Certain improvements in power looms for weaving.

916. John Henry Johnson, of Lincoln's-inn-fields, Middlesex. Improvements in the manufacture of tyres. A communication from Messrs. Jackson, Brothers, Petin, Gaudet, and Co., of Rive de Gier, France.

918. Samuel Eyre, of Bouverie-street, London, advertisement contractor. An improved application of portable mirror.

920. John Skirrow Wright, of Birmingham, Warwick, manufacturer. Improvements in the construction and ornamentation of belt or band fastenings.

Dated April 18, 1856.

922. William Westley, of Wellington, Derby, civil engineer. A new or improved nail or spike.

924. John Marsh, of Burnt Tree, near Dudley, Worcester, manufacturer. Improvements in fire grates.

926. Charles Frederick Stansbury, of Gracechurch-street, London. An improved mode of splicing and fastening the adjacent ends of the rails of a railway track. A communication.

928. Uriah Scott, of Camden Town, Middlesex, engineer. Improvements in metal fittings for furniture.

930. Thomas Walker, of Birmingham, Warwick, engineer. Improvements in governors or regulators of steam and other motive power engines.

932. Julius Jeffreys, of Kingston-hill, Surrey. Improvements in instruments for aiding respiration.

934. Josiah George Jennings, of Great Charlotte-street, Blackfriars-road, Surrey. Improvements in pumps.

Dated April 19, 1856.

938. Edmund Hunt, of Walnut-tree-walk, Lambeth, Surrey, practical chemist. Improvements in Hansom cabs and similar vehicles, parts of which improvements are also applicable to other carriages.

940. William Adkins, of Smallbrook-street, Birmingham, Warwick, draper. Measuring fabrics which he proposes designating the automaton measurer or draper's assistant.

942. William Jean Jules Varillat, of Rouen, France. Improvements in the apparatus for the extraction of colouring, tanning, and saccharine matters from vegetable substances.

944. Abram Longbottom, of Moorgate-street, London, engineer. Improved means of lighting and ventilating mines.

946. François Jean Bouwens, of Malines, Belgium, architect. A new rotative steam engine.

Dated April 21, 1856.

948. James Nasmyth, of Patricroft, near Manchester, Lancaster, engineer, and Herbert Minton, of Stoke-upon-Trent, Stafford, china manufacturer. Certain improvements in machinery or apparatus employed in manufacturing tiles, bricks, and other articles from pulverised clay.

950. Jules Dortet, gentleman, of Paris. An improved padlock.

952. Joseph Auguste Marie Touet Chambor, of Paris. Improvements in fire-places.

954. James Hansor, of Portland-place, Wandsworth-road, Surrey, practical chemist. Improvements in the manufacture of illuminating gas.

Dated April 22, 1856.

956. John Thomas Stroud, of Suffolk-street, Birmingham, Warwick. Improvements in stop cocks or taps for regulating or cutting off the passage of gas to combined gas burners.

958. Alexander Symons, of George-street, Mansion House, London, and Edward Burgess, of Clerkenwell-green, Middlesex. Improvements in apparatus for producing alarums to indicate burglary by means of electricity.

960. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. A new method of obtaining purified oil from coal, shale, and other bituminous substances. A communication from Alfred Ely Beach, of New York.

962. William Smith, of Woolston, Fenny Stratford. Improvements in constructing and applying windlasses for working ploughs and other agricultural implements.

964. David Lloyd, of the Ebbw Vale Iron Works, South Wales, engineer. Improvements in washing minerals, coal, and ores.

966. Thomas Evans Blackwell, of Cornwallis-grove, Clifton. An improvement in treating water for the use of brewers.

968. Richard Archibald Brooman, of 166, Fleet-street, City of London, patent agent. Improvements in or connected with centrifugal machinery. A communication.

Dated April 23, 1856.

970. George Forster, of Standish, near Wigan, Lancaster, colliery viewer. Certain improvements in the arrangements of trap-doors or air-doors, and their cases in the workings or passages in mines, whereby the efficient ventilation is maintained, which said improvements are also applicable in other similar situations.

972. James Garnett, of Low Moor, Clitheroe, Lancaster, cotton spinner. Improvements in twisting, winding, and reeling yarn, and in machinery or apparatus employed therein.

974. Thomas Squire, of Latchford, Chester, tanner, and Charles Frederick Claus, of the same place, practical chemist. Improvements in the manufacture of artificial manure.

976. William Henry Balmain, of St. Helen's, Lancaster, manufacturing chemist, and Thomas Colby, of the same place, practical chemist. Improvements in the manufacture of alkalies from their sulphates.

978. Peter Ward, of the Patent Alkali Works, St. Helen's, Lancashire. An improvement in furnaces used in the manufacture of alkali.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," May 6th,* 1856.)

2893. Charles James Appleton. Improvements in machinery or apparatus for knitting. A communication.

2908. David Dick. A new and improved regulator for gas.

2930. Edwin Ladmore. A new or improved method of securing ramrods to military fire-arms.

2936. Thomas Fielden Uttley. Improvements in the mode of applying fusible plugs to steam boilers.

2941. John Pemberton Turner. A new or improved method of shanking metallic buttons, applicable to the heading of nails and other like purposes. A communication.

2949. Silvester Lees, Edward Lees, and George Henry Newton. Certain improvements in machinery for spinning and doubling cotton and other fibrous substances.

2951. William Edward Newton. An improved process of tanning. A communication.

1. Henry Truelove. Improvements in gloves.

5. William Beckett Johnson. Improvements in steam boilers and engines.

8. Andrew Shanks. Certain improvements in machinery for cutting screws.

9. William Bullough. Improvements in machinery or apparatus for sizing yarns.

14. Frederick Haines. The deadening of sound, and the prevention of vibration and concussion in

connection with machinery, gun and mortar boats, and general ordnance, and other purposes.

16. George Williams. Improvements in the construction of water-closets for ships.

26. James Frederick Lackersteen. Improvements in the prevention of collisions on railways.

33. Robert Grey. Improvements in machinery or apparatus for moulding bricks, tiles, and other similar articles.

41. Robert Sam North and Ralph Peacock. Improvements in metallic packings for pistons.

59. Carlo Pietroni. Improvements in printing on cloth and other fabrics. A communication.

100. Edward Hammond Bentall. An improvement in the construction of machinery for cutting and pulping turnips and other vegetable matters.

104. Anne Emilie Malteste. Improvements in shirts.

118. Johnson Thompson. Improvements in ships' keelsons.

140. Edward Myers. Improvements in buffers and other springs for railways and other carriages.

205. Gentle Brown. An improvement in the manufacture of cast steel.

212. Edward Vincent Gardner. Improvements in heating, drying, dessicating, and evaporating.

244. Joseph Fowell Walton and Honoré Le François. Improvements in cleaning forks, spoons, stewpans, and other culinary utensils.

264. Thomas Burdett Turton and John Root. Improvements in buffer bearing and draw springs.

528. John Reading. New or improved fastenings for attaching watch keys, seals, watches, lockets, articles of jewellery, and ornamental articles of dress in general, to chains, and for securing the catches of brooches.

623. Louis Joseph Richard. Improvements in sugar manfacture.

684. William Henry Barlow. Improvements in covering and constructing bridges, viaducts, floors, and other structures of a like nature when iron is used.

698. William Clay. Improvements in the manufacture of wrought or bar iron.

765. Adolphe Guido. Improvements in cleansing, washing, scouring wool and woollen fabrics, and yarns.

777. Alexander Prince. Improvements in steel pens for regulating the elasticity thereof. A communication.

781. Charles Baptiste. Improvements in machines for manufacturing tenons and mortices. Partly a communication.

786. John Gray. Improvements in steam boilers, furnaces, and fire bars.

794. James Smith Cottrill. Improvements in presses.

822. James Hogg and John Napier. Improvements in stereotyping.

830. Arnold Morton. Improvements in the manufacture of paints and pigments.

842. Arnold Morton. Improvements in the manufacture of paper hangings for decorative purposes.

843. William Terry. Improvements in breech-loading fire-arms.

845. John Adams. Improvements in knitting machinery.

869. James Burnside. Improvements in apparatus for propelling and steering ships and boats.

889. Samuel Cunliffe Lister. Improvements in spinning.

890. William Warren and Warren de la Rue. An improvement in the manufacture of envelopes.

902. William Fuller. Improvements in ice pails.

910. John Henry Johnson. Improvements in cleansing and hulling grain and seeds, and in the machinery or apparatus employed therein. A communication.

912. William Little. Improvements in lamps for burning paraffine and bituminous oils or naphthas.

916. John Henry Johnson. Improvements in the manufacture of tyres. A communication.

930. Thomas Walker. Improvements in governors or regulators of steam and other motive power engines.

934. Josiah George Jennings. Improvements in pumps.

954. James Hansor. Improvements in the manufacture of illuminating gas.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1057. Henry Constantine Jennings.
1061. George Murton and William Hatton Langshaw.
1075. Richard Quin.
1080. Frederick Arnold.
1094. John Scott Russell.
1095. Charles Goodyear.
1097. William Edward Newton.
1109. Thomas Symes Prideaux.
1116. John Ryan Danks and Bernard Peard Walker.
1121. Christopher Nickels.
1125. James Nichol.
1151. John Henry Johnson.
1156. Marie Pierre Ferdinand Mazier.
1186. Richard Archibald Brooman.
1223. Bernard Peard Walker and James Warren.
1285. William Edward Newton.
1303. William Henham.
1336. George Goodlet.

LIST OF SEALED PATENTS.

Sealed May 1, 1856.

2445. William Henry Walenn.

Sealed May 2, 1856.

2452. Warner Staufen.
2457. James Heginbottom.
2478. Henry Clinton Page.
2488. Joseph Jessop.
2489. Frederick Ludewig Hahn Danchell.
2491. Joseph Schloss.
2496. George Cotsell.
2500. Frederick Scholefield.
2503. William Davis.
2563. William Barnes.
2587. James Yates and Thomas Rawlins Birch.
2600. John Fleetwood.
2647. John Elce and George Hammond.
2648. Samuel Ratcliffe Carrington.
2661. Frederick Osbourn.
2677. John Henry Johnson.

2684. George Richardson.
2855. John Henry Johnson.
2860. John Pierrepont Humaston.
79. John Erskine.
86. William Pole and Frederick William Kitson.
178. William Johnson.
302. Matthew Whiting, jun.
376. Thomas Parkinson Capp.
578. David Yoolow Stewart.

Sealed May 6, 1856.

2499. Joseph Haley.
2523. Henry Fletcher.
2534. Henry Wickens.
2536. Jules César Alexandre Bouillotte.
2537. Louis Joseph Frédéric Margueritte.
2540. George Cooke.
2241. Thomas Hitt.
2557. Robert Murdoch.
2645. John Jobson.
155. Charles Robertson.
169. Edward Lawson and George Jennings.
215. William Spurrier.
387. Thomas Evans Blackwell.
420. William Gwillim Merrett.
453. Frederick William Mowbray.
469. James Warburton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

J. Piller.—Your letter is in type and will shortly be published.
Mariquita.—We regret that we are not able to answer your questions.
The publication of several articles and letters is deferred.

CONTENTS OF THIS NUMBER.

Palmer's Improved Reaping Machine—(*with engravings*) 433
Sir James South and the Royal and Royal Astronomical Societies 434
Rennie's Improved Marine Boiler—(*with engravings*) 437
Pugh's Railway Signals—(*with an engraving*). 438
Hughes' Compensating Wedges 439
Experiments with Whitworth's Rifle Cannon 439
Improvements in the Manufacture of Cast Steel 441
Hope's Improvements in Producing Designs for Needlework on Fabrics 441
Captain Norton's Dissolving-Band Rivets for Concussion Fuses—(*with an engraving*) 441
Tolson's Cloth Patent 441
Newly-Discovered Gas Coal 442
Extension of the Smoke Act 442
Woodcock and Gardner's Patent Furnaces—(*with an engraving*) 442
Mechanical Locomotion 444

Specifications of Patents recently Filed:

Daines	Protecting Buildings	446
Lowe	Screw Propellers	446
Harcourt	Bell Furniture	447
Manby and Piper	Cutting Stone	447
Musto and Bear	Tobacco	447
Newton	Metal Castings	447
Wright & Wright	Crushing Grain	447
Whitworth	Railway Signals	447
Laporte	Candles	448
Ensor	Bobbin Net or Twist Lace	448
Huguenin	Watches, &c.	448
Norbury	Hydraulic Presses	448
Bouchet	Capstans, &c.	448
Nasmyth	Rotary Engines	448
Hughes	Compensating Wedges	448
Fontainemoreau	Forging Iron	448
Guilbert and Guillemere	Bridles	448
Atkinson & Ridge	Steam Boilers	449
Poignand	Wedges and Keys	449
Théry	Coffee	449
Gray	Nautical Instrument	449
Pitman	Screw-wrench	449
Johnson	Gas from Peat	449
Robey and Scott	Boilers	449
Good	Thrashing Machines	450
Barlow	Mules, &c.	450
Chadwick. Frost, Hanson, & Chadwick	Water Meters	450
Beattie	Railway Wheels and Axles	450
Illingworth	Printing Earthenware	450
Radcliffe	Damping Fabrics	450
Bellford	Ventilating Hats	450
Kempe	Pile Fabrics	450
Augier	Teapots, &c.	451
Baker and Miller	Register Stoves	451
Uchatius	Cast Steel	451
Hope	Designs for Needlework	451
Musgrave, Musgrave, and Musgrave	Cooking Stoves	451

Provisional Specifications not Proceeded with:

Hudson	Coffee Pot	451
Simmonds	Bedsteads	451
Gardner	Buttons	451
Clive	Photography	451
Roberts	Cements	451
Crankshaw	Sizing Warps	452
Hilles	Blind-Pulleys	452
Newman	Railway Wheels	452
Nottidge	Manure	452
Dyke	Cutting Grass	452
Thwaites	Teeth	452
Thomson	Furnaces	452
Mitchell	Buffers & Draw Springs	453
Herepath	Surgical Instruments	453
Gedge	Braid	453

Provisional Protections 453
Notices of Intention to Proceed 454
Patents on which the Third Year's Stamp-Duty has been Paid 455
List of Sealed Patents 455
Notices to Correspondents 456

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1710.] SATURDAY, MAY 17, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

COWBURN'S IMPROVED BOILERS AND VALVES.

Fig. 1.

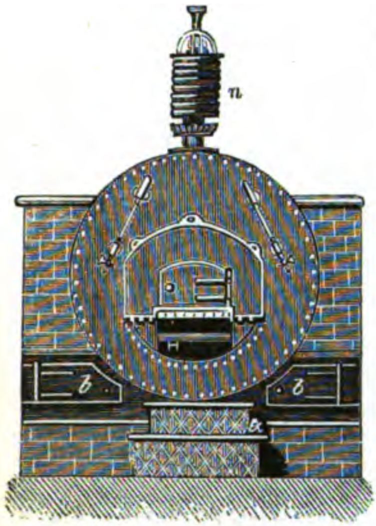


Fig. 2.

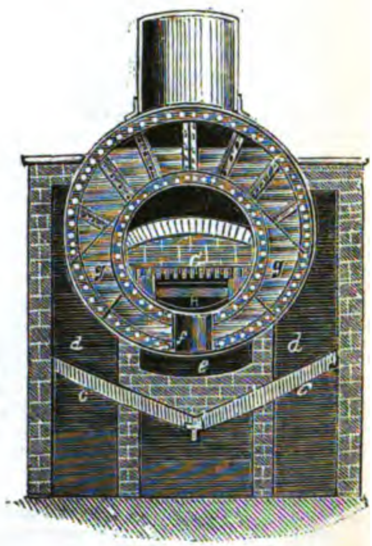
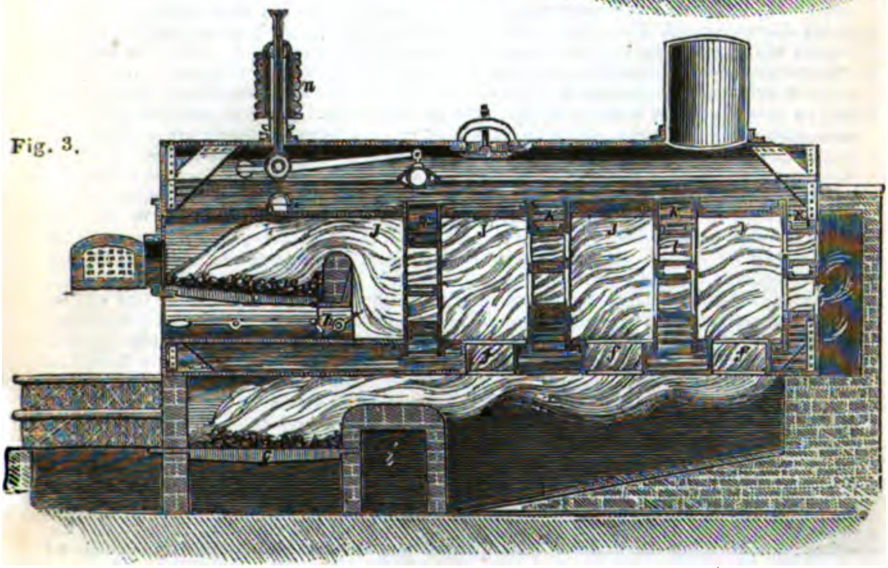


Fig. 3.



COWBURN'S IMPROVED BOILERS AND VALVES.

Messrs. Cowburn & Co., of Manchester, have introduced an improved cellular boiler, and an oscillating safety valve, which we have represented in the accompanying engravings: Fig. 1 is an end elevation of the cellular boiler as it would appear in working order, and shows the platform *a*, from which the upper internal furnace is fired. The doors *b*, *b*, to the right and left, are for firing the lower external furnace. Fig. 2 is a cross section, showing the upper and lower fire grates, *c*, *c*, *c*, the brickwork and longitudinal return flues *d*, *d*, also the centre flue *e*, with one vertical pipe flue, *f*, and the tube-plate wing stays, *g*, *g*, that secure each part, on right and left, to the shell of the boiler. Fig. 3 is a longitudinal section showing the swing door *h* in the upper fire-bridge, for the two-fold purpose of admitting a due supply of air, and of removing the ashes and flue dust. The bridge of the furnace under the boiler is hollow at *i*, to admit of the return flue current passing from one side of the boiler to the other. The internal flue consists of a series of compartments or cells, *j*, *j*, between which are the walls of water, *k*, *k*, penetrated by a number of short wrought-iron pipes, *l*, *l*, that connect and secure each portion of the internal flue, longitudinally, with one another, and with the ends of the boiler. Each chamber or cell is also connected with the bottom of the boiler by a series of vertical flue passages, *f*, *f*, which admit the products of combustion from the lower fire, and allow the flue dust to precipitate into the spaces beneath. The pipes placed between the fire-box and first cell are three in number (represented by dotted circles in the cross section, Fig. 2), one of which is placed over the two others, for the purpose of enticing the flames to descend after passing over the bridge, and to intercept the flames from the lower fire at the bottom of the first cell. The flames, being thus united, rise to the *top* of the second cell, as the second series of pipes are arranged in an inverse position to the first (two placed over one), pass through them, again receive additions from beneath, and undulate and intermix in their passage from cell, through pipe, to cell. The united products of combustion are thus made to pass through the water previous to their combined return by the side of the boiler, and a considerable addition of heating surface is thus obtained under the boiler The safety valve *n*, is a ball valve resting upon the end of a pipe, weighted by rings of cast-iron, hanging below the seat, which give the valve an easy property of self-adjustment, and, as the steam escapes, furnish it with an oscillating motion that preserves the good fit of the valve. There is another office performed by a float within the boiler. Upon the water getting too low it opens a swivel valve, which lets off the steam through a distinct passage through the ball to the atmosphere, thereby giving notice of the shortness of water in the boiler.

The following advantages are claimed for this boiler by the inventors:—"1st. The iron composing the boiler being more equally heated by the united furnaces, and the expansion being also more equal, there is less liability of one rivet-hole being ripped into another; fewer repairs will be requisite, and one cause of explosion will be removed. 2nd. The cellular construction of the internal flue, by which it is secured to the sides and bottom of the boiler, gives it little tendency to float or vibrate. 3rd. The motion and commotion of the water will be much less than in other boilers, from its being sub-divided in area, and from the cells acting as breakwaters; steam engines, also, will not be so frequently broken by priming or gorging water instead of pure steam, and boilers will be less frequently strained from the same cause. 4th. From the central position of the internal flue, the boiler requires no longitudinal stays, and the flue being fifteen inches from the bottom of the boiler, there is plenty of room left for a man to pass through or under for the purpose of inspecting, cleansing, or repairing. There is no part of the whole structure that cannot easily be reached, for the vertical passages that unite the internal and external flues are sufficiently large to admit a man; they can be lessened, however, if required, by introducing bricks. 5th. From the immense heating surface obtained by this arrangement common fuel will be found sufficient; tanners may consume their spent bark in the lower fire, and proprietors of saw-mills may burn their chips and saw-dust. 6th. The mode of supplying air and fuel, and the frequent interception of the products of combustion, are features in favour of this boiler as a smoke consumer. 7th. As compared with a common two-flue boiler of equal diameter the cellular boiler will contain more room within by the contents of one flue, or it may be constructed to that extent smaller, and therefore lighter and cheaper; and by adopting (in proportion to the advantage gained) a small diameter of boiler nearly the same weight of iron, that in a larger diameter would only allow of thirty pounds' pressure, will, by adopting the small diameter, safely carry sixty pounds. There will also be a more natural circulation of the water by applying the principal heat under the water, as, before steam can be formed, the increments of heat will have to effervesce through all the water before reaching the surface. The internal flue will not be impaired by deposit of

flue dust, as the large vertical passages will allow the dust and soot to fall to the space below "

Another arrangement of oscillating safety-valve is shown in figs. 4 and 5: A, is the boiler; B B, are the firing-doors; C C, the hinge-pin, the upper part of which is bent, to form a catch; D D, E E, ball valves, the bottom parts of which are of brass; F F, the

Fig. 4.

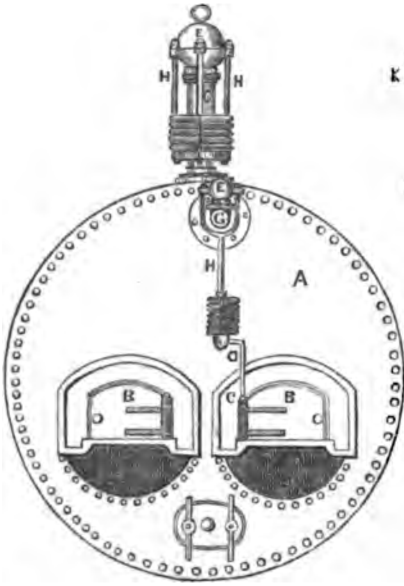
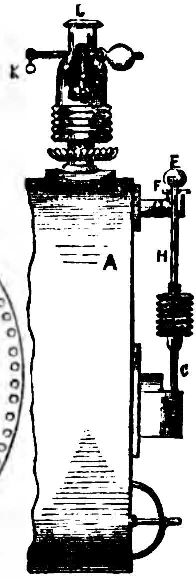


Fig. 5.



seating, also of brass, supported by the pipes G G; H H, pendants supporting ring and cake weights, I I, against which the catch, D D, comes in contact every time the doors are opened or closed, causing the valve to oscillate on its seating.

J is a new design, consisting of cast-iron tubular weight, or shell to carry the ring weights; also to convey the steam, after it has issued by the valve, through the funnel, J, to any place that may be desired. There is also a vacuum or inverted valve introduced for a new purpose, viz., by pulling at the chain, K, to let off the steam when required.

It should be stated that many of Cowburn's oscillating safety-valves have been at work upwards of twelve months in Manchester and elsewhere, and have given great satisfaction.

FARADAY'S EXPERIMENTAL RESEARCHES IN ELECTRICITY.

(*Continued from page* 391.)

As another instance of the purely *metaphysical* puzzles into which Faraday gets himself, we quote the following from one of his most recent papers, " On some Points of Magnetic Philosophy" (Proceedings of the Royal Institution, Jan. 19, 1855, pages 566—574 of the present volume).

" The notion of the gravitating force is, with those who admit Newton's law, but go with him no further, that matter attracts matter with a strength which is inversely as the square of the distance. Consider, then, a mass of matter (or a particle) for which present purpose the sun will serve, and consider a globe like one of the planets, as our earth, either created or taken from distant space and placed near the sun as our earth is; the attraction of gravity is then exerted, and we say that the sun attracts the earth, and also that the earth attracts the sun. But if the sun attracts the earth, that force of attraction must either arise *because* of the presence of the earth near the sun; or it must have *pre-existed* in the sun when the earth was not there. If we consider the first case, I think it will be exceedingly difficult to conceive that the sudden presence of the earth, 95,000,000 of miles from the sun, and having no previous physical connection with it, nor any physical connection caused by the mere circumstance of juxtaposition, should be able

to raise up in the sun a power having no previous existence. As respects gravity, the earth must be considered as inert, previously, as the sun; and can have no more inducing or affecting power over the sun than the sun over it: both are assumed to be *without* power in the beginning of the case; how, then, can that power arise by their mere approximation or co-existence? That a body without force should raise up force in a body at a distance from it, is too hard to imagine; but it is harder still, if that can be possible, to accept the idea when we consider that it includes the *creation of force*. Force may be opposed by force, may be diverted, directed partially or exclusively, may even be converted, as far as we understand the matter, disappearing in one form to reappear in another; but it cannot be created or annihilated, or truly suspended, that is, rendered existent without action or without its equivalent action. The conservation of power is now a thought deeply impressed upon the minds of philosophic men; and I think that, as a body, they admit that the creation or annihilation of force is equally impossible with the creation or annihilation of matter. But if we conceive the sun existing alone in space, exerting no force of gravitation exterior to it; and then conceive another sphere in space having like conditions, and that the two are brought towards each other; if we assume that, by their mutual presence, each causes the other to act,—this is to assume not merely a creation of power, but a *double creation*, for both are supposed to rise from a previously inert to a powerful state. On their dissociation, they, by the assumption, pass into the powerless state again, and this would be equivalent to the *annihilation* of force. It will be easily understood that the case of the sun or the earth, or of any one of two or more acting bodies is reciprocal; and also that the variation of attraction, with any degree of approach or separation of the bodies, involves the same result of creation or annihilation of power as the creation or annihilation (which latter is only the total removal) of either of the acting bodies would do."

We are here plunged headlong into the fathomless abyss of metaphysics, and involved in the labyrinth of discussion about the relation between "cause" and "effect," which has prevailed ever since the birth of philosophy, and may, for aught we know, continue till its death. Without presuming to dogmatize on a question which has divided the most original and profound thinkers, we may venture, perhaps, to express our own views on this point, as coinciding with those maintained by Dr. Thomas Brown, in his "Inquiry into the Relation of Cause and Effect." When two events, A and B, have been uniformly and invariably observed to go together, A being constantly followed by B, then we call A the *cause* of B, and B the *effect* of A.

Further than this we believe the human mind cannot penetrate. To inquire "*why* A is invariably followed by B," is either a question which, on reflection, we shall find to be unanswerable, or else the answer will be found (as in all physical *discoveries* which have ever been made) to *consist* in the simple fact that *between* A and B there is some *third* event, X. Still this third event brings us no nearer to the solution of the original mystery, "*why* A is always followed by X, and X by B?" The ultimate and final *explanation* of all possible physical phenomena will be found to consist in the simple statement of some *fact*, of which fact itself nothing can ever be known beyond its mere existence. To make this clear, let us take as an example that *fact* to which all mechanical philosophy reduces itself—viz., the fact that when one particle of matter is brought sufficiently near to another particle of matter, this second particle *must move*, or else, if it does not move, there is a sensation of *pressure* in any sentient being by whom the first particle is held and brought near to the second.

At first, it appears perfectly clear *why* the second particle must move, viz., because of the *contact* of the first particle with it; but when we learn (as we soon and easily do learn) that the particles of even the most dense and solid substances (such as gold) are *not* in contact, that even in cases of the most violent *collision*, the particles are not in contact, we find that our notions are not so clear as we imagined, that our "explanation" explains nothing. The ultimate fact we find to be simply this, that when the particle A is brought *within a certain distance* from B, then B moves, or else there is a sensation of pressure, if it be a sentient being by whom the force is applied. Suppose, for the sake of fixing the ideas, that the nearest approach which one particle of matter can ever make to another particle of matter, is the millionth part of an inch. Does the reader find it any easier to see *why* B should move when thus approached by A, than why the earth should move when the sun approaches it within ninety-five millions of miles? Does the mere *difference of distance* explain anything? For our own part, we cannot say that it does. We find quite as much difficulty in assigning the reason for the motion of a stone when kicked by the foot, as in assigning the "cause of gravitation." The latter *fact* is not more "mysterious" or incomprehensible to us than the former. Fa-

raday, however, declares that to *him* it *is*: and seems to think, that if there were only "juxtaposition" of the sun and earth—instead of an interval of ninety-five millions of miles—he could understand it easily. We confess that his "imaginative" faculties must be very different from ours, for his "Lines of Force" are to us as utterly unintelligible and mystical as they appear to him to be clear and satisfactory. Were the sun and earth brought within the millionth of an inch from each other, "gravitation" would be just as inexplicable as at present, in our apprehension, at least.

The time will come when all philosophers will be fully convinced of the impossibility of going beyond the simple statement of *facts* in their "theories," "explanations," or whatever be the term applied to their attempts at "explanation." Every such attempt *must*, from the very nature of things, end in the bare statement of some *fact* or facts. It is true, that all real *discovery* reduces some hitherto *strange* fact to a *more familiar fact*; as, for example, when Newton showed that the *motion of the moon* (a *strange* fact in his day), was of the same kind and depended on the same cause as the motion of a falling body on the earth (a more familiar fact). But beyond this familiar *fact* itself, the human mind never *can* go. All physical science is made up of this reduction of facts which have heretofore been *strange*, to others which have been familiar. Ultimately, all the facts of electricity, magnetism, heat, light, will be resolved (like astronomical facts), into the simple elements or facts of *matter* and *motion*; and beyond that point the human mind will never proceed. It may succeed in calculating the *motions* thus characterising the various branches of physical phenomena, as fully as the motions of the planets are now calculated: but when it comes to ask why one particle of matter should move on the approach of another—it will ask in vain. In our present mental organization, indeed, the question has liteally no *meaning*.

Faraday's argument about the "creation" and "annihilation" of force, is a very strange one. Granting the foundation of his argument (and we shall see presently in what sense only it *can* be granted) viz. that force can neither be created nor annihilated, it will still be obvious that his argument is good for nothing. "Conceive," says he, "the earth created or taken from distant space and placed near the sun,"—this will "create" a force which did not hitherto exist, viz. the mutual attraction of the sun and earth; *Where is the force that is to bring the earth "from distant space," or to create it? What has become of it?* Faraday "creates" his earth, or brings it from "distant space" with all the ease imaginable, but when he has got it within ninety-five millions of miles from the sun, he wonders beyond all measure at the *new* "creation of force!" His argument is good for nothing even to the Atheist; and it is needless to say that a supreme "Creator" can have no more difficulty in "creating" force than in creating the earth, or "bringing it from distant space."

[We cannot refrain from adding here, what has always appeared to us *the* grand and invincible "proof" of the existence of an *Intelligent Creator* of the Universe: and that is the simple fact of *motion* in the heavenly bodies or any other inorganic matter. We constantly see such matter put into motion by human or other intelligent beings on earth, and we never see it as the independent *source* of motion. Hence it is more rational to conclude that the *source of all motion* was intelligent than non-intelligent.] (*To be continued*)

ON LARGE BELLS AND BELL MACHINERY.

(*Continued from page 365.*)

REMARKS ON THE FORMS, METHODS OF CASTING, AND RINGING OF LARGE BELLS. BY C. H. SMITH, HONORARY MEMBER.

Resumed Discussion at the Ordinary General Meeting of the Royal Institute of British Architects, Jan. 28th, 1856.

The following letter was read from Mr. Chantrell, Fellow:

THE bells of the Carillon at Bruges, said to be one of the finest in Europe, have the same form;* they were cast in 1680. The greatest bell is about 10½ tons in weight, in G, and is used to strike the hour; the half-hour bell is in C. There are four octaves, and modern pieces of music are played upon them every Wednesday, Saturday, and Sunday, for the space of an hour. A large brass cylinder, 9 feet long and 7½ feet in diameter, is placed in a room below the bells, and four pieces of music are set by pegs (like the barrel of an organ) upon it, which chime every quarter of an hour. These bells are hung on wooden frames and struck by hammers outside, which are raised by wires and levers, moved by the brass barrel: they may be heard at some distance from the town. The tower is octagonal, and the eight large apertures or windows are open, so that the bells are seen and heard very clearly. There is a Carillon at the Church of the Dunes, attached to the Sèminaire; but being in a louvre-boarded tower, it is only heard at a small distance. At Courtrai, the Carillon is very fine, and the tunes are very distinct.

* That is a general form resembling an equilateral triangle.

Mr. E. B. Denison, Visitor, Q.C., said: Mr. Smith said the other night that his object was to open the door to a discussion on this subject of bells, rather than to express any particular views of his own. I will show you some instruments which will give a grander effect under certain circumstances than a bell of the same weight. Here is the common contrivance of a clock striking on a long steel wire coiled up, so as to produce a tone deeper than the heaviest cathedral bell, but not too loud for a room. And if you want a loud noise without much music in it, you can go and listen to the riveting of boiler plates, or the shriek of a steam whistle. What a church bell or a public clock-bell has to do, is to make a loud and distinct musical sound. This gong makes a very loud noise, and also one of a musical character; and look how light a gong is in comparison to a bell of the same note. But the gong, which sounds so loud in this room, besides not answering at once to the blow, as a clock-bell must, is inaudible at half the distance at which a common dinner-bell of no greater weight may be heard distinctly. Compared with those deep-sounding clock springs like the one I struck just now, the common clock-bell is a powerful instrument, and gives a loud and pleasing sound at a distance where the springs are almost inaudible. There is another apparatus—that is a circular plate, or a flat rod of metal suspended on two strings near its ends. The sound is very solemn and imposing compared with a bell of the same weight. But if you were to move off to the distance of two rooms, you would hear this fine sounding plate as nothing better than an iron pot, while the bell would still sound clear and distinct.

Mr. Taylor mentioned some gigantic tuning-forks which were put up at St. Nicholas' Church, at Hamburgh, as a substitute for bells. I think they cannot be very successful, because Mr. Scott, who (as you all know) is building the church there, is ignorant even of their existence. If they had proved effective substitutes for bells, Mr. Scott and Mr. Wheatstone would have been pretty sure to hear of it. They resemble those musical clock springs which you heard just now, and which produce such a feeble sound at a distance. Hemispherical bells, which are of the same thickness throughout, bear something of the same relation to the common church bell with a *sound-bow* much thicker than its *waist*, that the musical springs bear to the spherical bell: that is to say, they give a much deeper note from the same weight of metal, but at the same time a much weaker one.

It is noticed in some books, that if you strike one of these common clock-bells, and apply to it a tube, with its mouth directed towards the edge of the bell, you will rouse up a great addition to the sound. Several tubes of different sizes will do for the same bell, producing different qualities of tone. [Mr. Denison showed the experiment, and the effect was very obvious.] Here is a means of getting a body of sound out of a comparatively light bell with the addition of nothing more than a tin tube. But though the after sound is thus increased, the noise of the actual blow is not materially increased by the tube—certainly not to anything like the loudness of this other bell [showing one] of the same weight and the common form. And here is another curious fact: we cannot find any tube which will produce any sensible effect towards increasing the sound of this common bell. If I am to offer a guess at the reason of this, it is that the upper part of the common bell, which is nearly a tube in shape, does really act as the sounding tube to the vibrations of the bell when struck. My guess is rather confirmed by the fact that applying a second tube to a spherical bell after you have got one to suit, does not do much more than using only the single one, and the shape of this upper part of a bell undoubtedly affects the quality of its sound.

Then we come to Mr. Smith's double conical spindles. It is interesting to find that a musical sound can be got out of such unpromising shapes of metal. But take one of these spindles, and feel the weight of it compared with this small bell, and now listen to the sound of the two. (The sound of the bell was very much the most powerful.)

From these and other experiments I have come to the conclusion that bells of the common and well-known shape, with a thick lip or sound-bow, are the most effective known instruments for producing a loud musical sound, and I am equally satisfied that there is nothing to be gained by deviating materially from the established proportions of the best old bells. Professor Wheatstone having been commissioned by the Board of Works, with Sir C. Barry, to collect information at the late Paris Exhibition "respecting the most esteemed chimes in France and Belgium, and whether there are in those countries makers acquainted with the traditions of the art, or who have applied the discoveries of science to the improvement of bells, *or to efficient substitutes for them*," has come back with the conclusion that no such efficient substitutes have been discovered, nor is there any known improvement on the established mode and materials for casting them. Sir C. Barry and he indeed seem to have been rather impressed with the merits of the cast steel bells which

you may have seen noticed in the newspapers. But I have heard such decided condemnation of their harshness of sound from persons of experience in such matters, that I do not the least believe in their being received generally as an efficient (though they may be a cheap) substitute for the more expensive compound of copper and tin; and that seems to be Professor Wheatstone's opinion also.

But although satisfied that the common form and material of large bells, such as we want at Westminster, are substantially the right ones, there still remains a great deal to do to ascertain the more precise details of form and composition which will produce the best sound out of a given quantity of metal. That there is something very wrong in the modern style of casting large bells, is manifest from this—that everybody who has paid any attention to the subject, complains of the lamentable inferiority of modern bells to old ones, and even to bells made in the early part of this century. I have heard people describe bells as "very fine," which I would not buy at a penny a pound, except for the purpose of selling again at ninepence. As for the opinion of musicians, as such, I value it rather less than that of other people, because I have always found that the first and almost the only thing they look at, is whether a peal of bells are in tune with each other, the least important part of the business for two reasons; first, because if they are out of tune (unless very atrociously), they can be cut into tune; and secondly, because a set of iron saucepans could be made as perfectly in tune as the finest peal of bells. And with regard to single bells, where the question of tune does not arise, still, unless a man knows by experience what kind of sound a certain weight of bell metal ought to produce, it is impossible that his judgment can be worth anything on the merits of any particular bell. Most Oxford men believe their Great Tom is a very fine bell, just because it makes a loudish noise, and they have no idea, and cannot have any, whether it is either the quantity or quality of noise which ought to come out of a bell of 7½ tons. Whereas, I know that a *good* bell of half that weight would give a much louder and a much pleasanter sound, and that, in fact, the bell is about as bad as possible. I mention that because it is not a modern one, having been cast in 1680; and because the *occasional* occurrence of bad old bells, and also of good modern ones, proves that the general badness of the modern ones, compared with the general goodness of the old ones, is not to be accounted for by the hypothesis that they improve by age; though it is true, that they generally do improve a little for a few years. Without saying that any of the modern large bells, such as those of York, Lincoln, and Montreal, are quite as bad as the Oxford bell, they are all very far short of what they ought to be, and very inferior to the *old* Tom of Lincoln, which was cast in 1610, and was considered the finest large bell in England, as I can easily believe from the density of the metal.

We have a ready means of discovering whether a bell is both soundly cast and of good metal, by simply taking its specific gravity for the soundness, and analyzing a piece of it for the purity. You may file off enough from any bell to enable a chemist to analyze it, and see whether it contains any baser (that is, cheaper) metals than copper and tin. And we know what the specific gravity ought to be: the old Lincoln bell was 8·78, and the old Doncaster bells of 1722 were 8·76. The French authorities on the subject, I find, put it as high as 8·82, and from actual experiment. It is remarkable that there is scarcely any difference between the specific gravity of the alloy, whether it contains the largest or smallest proportions of tin to copper that are ever used; because, though the tin is much lighter, it makes a denser compound with the copper until it reaches the proportion of speculum metal, about 1 to 2; whereas, bell metal never has more tin than 1 to 3, and the modern bell metal not so much as 1 to 4, because it is put in the proportion of 1 to 3, and the tin wastes in melting. The specific gravity ought to be 8·75 at least. The old Lincoln bell contained rather less than ·75 of copper, and the rest was tin ·20, and antimony, and a very small quantity (no doubt accidental) of nickel, with what the chemists call mere traces of some other metals. No antimony is found in the old Doncaster bell metal, nor, I understand, in that of the old York bells, in which the proportion is 1 of tin to 3 of copper, as in the Lincoln bell it is about 1 of tin and antimony together to 3 of copper. The bell-founders do not like this *high* metal, as it is called, because it is harder to cut if the bells require tuning; but they have no business to want tuning, and never do when they are cast of the proper thickness for their size. But the more the tin is reduced below the point where it would make the metal too brittle, the less time the bell appears to hold the sound when it is struck. You will find that 4 of tin to 13 of copper produces a very hard, elastic, and strong bell metal, very like the Lincoln bell in appearance.

Lord Rosse's method of getting a sound speculum, by casting it on a cold bottom, would not do for bell-founding; for you will see at once, that a thing of the shape of a bell cannot cool in layers, like a flat specu-

lum of uniform thickness. What we want is, a method of keeping the metal in the upper part or waist of the bell hot and fluid as long as possible, so that it may keep falling down into the sound-bow or thick part as the metal cools there. Moreover, copper and its alloys of tin have this remarkable property, that the slower they are cooled, the harder and denser they are. A bell-metal bullet cast in a cold mould, and thrown into water as soon as it is solid, is quite soft and stringy inside, though very smooth outside, compared with one cast in a hot mould, and cooled as slowly as possible; indeed they are so different, that you would suppose the latter had twice as much tin in it as the former if you did not know their history. Mr. Varley tells me, that some copper cylinders for printing were cast of even greater density than hammered copper, by forcing the metal down into the runner or "git" with a piston heavily weighted.

But there is another cause of the inferiority of modern peals of bells, which is, that less metal is now used to produce a given note than in the old bells. Between certain limits necessarily lies the thickness and shape of a bell which will give the best sound for its weight; if you make the bell larger and thinner than that best form (whatever it is), you lose in power and quality of tone, though you increase the depth of note; and if you make it smaller and thicker you raise the note, and when you get beyond a narrow limit you lose in power too, because the bell becomes too thick to be made to vibrate throughout. The most effective proportions for a bell are where the thickness of the waist is about $\frac{1}{33}$th and that of the sound bow about $\frac{1}{13}$th of the diameter. Eight bells of any metal and any shape, provided only they are all of the same metal and proportions, and of diameters in this ratio—30, 32, 36, 40, 45, 48, 60, will give the notes of the common diatonic scale, and in fact, be a peal of bells in perfect tune with each other. Moreover, their weights will vary as the cubes of the diameters, or the tenor be eight times as heavy as the treble. But in practice it is found expedient to make the two or three smallest bells, especially the treble, rather thicker and heavier in proportion, and within moderate limits there is no objection to it. For instance, in the grand old peal of Exeter Cathedral, the tenor is 67 cwt., and the third of the ten is rather more than one-seventh instead of one eighth of that weight. But in modern peals, you will be lucky if you get a tenor of eight bells more than four times as heavy as the treble, or the tenor of six more than double of the treble, though it ought to be nearly four times as much, even allowing for a little increase of thickness of the treble. Now, when you have not only inferior casting, but this system of spoiling all the large bells of a peal by thinning them besides, you need not be surprised at the badness of modern bells. The remedy for this is simple enough: stipulate that no bell in the peal is to be thinner in the sound-bow than $\frac{1}{13}$th of the diameter, and this defect will disappear at once.

This is a list of the largest bells in the world, according to the best information I can get from various sources:

	Weight. Tons.	Cwt.	Diameter. Feet.	Inches.	Thickness. Inches.	Note.
The great bell of Moscow, broken in 1737	193		21		23	
Bell at the Kremlin, fell in 1855	63		..			
Pekin	53		..		..	
Novogorod	31		..		..	
Vienna, 1711	17	14	9	10		
Sens	15	0	8	7		
Westminster, 1856	14		9	2	9	E flat
Erfurt, 1497 "Maria Gloriosa"	13	15	8	7½	..	F
Notre Dame, Paris, Louis XIV.	12	16	8	7	7½	F probably
Montreal, 1847	12	15	8	7	8¼	F
Cologne	11	3	..		..	
York, 1845	10	15	8	4	8	F sharp
Bruges	10	5	..		..	G
St. Peter's, Rome	8		..		..	
Oxford, 1680	7	12	7	1	6½	
Antwerp	7	3	..		..	
Exeter, 1675, very thick in the waist	5	11	6	4	5	A?
Lincoln, 1834	5	8	6	10½	6	A
St. Paul's, 1709	5	4	6	9½	..	
Ghent	4	18	..		..	
Boulogne, modern	4	18	..		..	
Old Lincoln, 1610	4	8	6	3½	..	B
Fourth quarter bell Westminster, 1856	4	0	6	1½	6	B flat

The Erfurt bell is said to be the finest in the world.

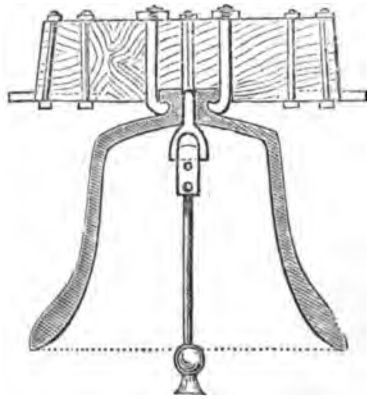
I am glad to say that Sir C. Barry has now arranged a perfectly open place, which you may see half way up the spire or roof, for the great Westminster clock bell to stand in, instead of being within the roof as originally contemplated.

If persons who have only raised 250*l.* or 300*l.* for bells, would spend it on a couple of large ones instead of five or six small ones it would be a great deal better. The ringing of two large bells together has a fine effect; and some day or other they might become the tenor and 7th of a good peal of six or eight.

The fallacy of hanging large bells high in the stock has been sufficiently exposed by Mr. Taylor. It has arisen from the ignorant and absurd idea that a bell is *lifted* up, like a stone by a lever, instead of being *swung* up by centrifugal force, like a stone in a sling.

I must not overlook the disease of which bells generally die, that is, cracking after the clapper has worn them thin in one place. I see Mr. Baker's model of his patent plan for turning a bell in the stock again upon the table. You may remember I suggested a plan for the same purpose in this room when I first saw the other, which you will understand from the annexed drawing.

It is nothing but a thick round neck to the bell instead of canons, with a flanch round the top, which is embraced by six bolts coming through the stock. The clapper-bolt runs square through the stock, and round through the top of the bell. When the bell is worn in one place, you



have only to loosen the bolts a little, and then a few of the ringers standing round the bell will easily twist it round a little way for the clapper to act in a fresh place. If this is done once in 10 or 20 years, according to the work of the bell, it may just as well last 1000 years as 100.

The Chairman, Mr. Penrose, V.P., observed that there would not be time to continue the discussion.

A vote of thanks to Mr. Denison was passed, and the adjournment of the discussion was agreed to.

(*To be continued.*)

TONNAGE ADMEASUREMENT.

To the Editor of the Mechanics' Magazine.

Sir,—Referring to the "Note on Tonnage Registration," in No. 1708 of the *Mechanics' Magazine*, page 420, correcting the typographical errors that unfortunately pervaded the exposition given in No. 1707 of Sterling's formula for calculating the cubical contents of an irregular solid or space, by means of rectangular coordinates referred to the circumscribing parallelopipedon, being an exposition of the rationale of the rule for tonnage admeasurement under the Merchant Shipping Act of 1854, your correspondent, on looking further into this matter, will, doubtless, observe that the list of corrections as given in No. 1708, page 420, are still far from completely correcting the typographical errors of the formula referred to as enunciated in No. 1707, page 392; and as a second edition of such typographical correction is inconvenient, your readers who may be giving attention to this subject would, probably, be obliged by your reprinting the whole formula, duly revised and corrected to facilitate their perusal thereof. I may further submit for your consideration, that by your introducing textually the rule for calculating tonnage as deduced from the formula referred to, and prescribed by the Merchant Shipping Act of 1854, you would still more satisfactorily elucidate this matter. Permit me further to suggest for your correspondent's consideration, whether, in the text explanatory of what is meant by the *curve of sections*, there are not some further errors, either typographical or textual, not clearly expressing the intended sense of the text. I also beg to intimate that when your article on the Merchant Shipping Registration Act in

exposition of my paper thereon, read before the Society of Arts on the 16th January, 1856, shall be completed, as I presume it will be on the correction of the errors, I may probably request the favour of your inserting a few remarks from myself referring to various points of your criticism on my paper, on which my acknowledgments are due to your anonymous correspondent or perhaps to yourself, as the editor of the *Mechanics' Magazine* and author of the article referred to,

I am, Sir, yours, &c.,

CHAS. ATHERTON.

Woolwich Dockyard, May 6, 1856.

The typographical errors in our note on tonnage admeasurement, in No. 1707, which were inserted in No. 1708, are not, after all, of much importance, and we are unable to discover any further error in the enunciation of Sterling's rule, except that in the 11th line on page 393, which runs across the page, instead of a_{n+1}, should be read a_{2n+1}—an error which we are convinced would not cause much, if any, inconvenience to the intelligent reader. We have, in our anxiety to keep this note within moderate bounds, (space in our columns being at present in great demand) so far erred in the latter part of it, that we have called that the "curve of sections" which ought to be called the "scale of displacement." The former of the two curves there represented is the curve of sections, and the latter the scale of displacement. However, these two curves have little or nothing to do with the main object of the note. We do not think these errors of sufficient importance to warrant our reprinting the whole note, with its several formulæ, as Mr. Atherton suggests.

The request that we should introduce textually the rule for calculating tonnage, as deduced from this formula, and legalized by the Merchant Shipping Act of 1854, is in our opinion, unreasonable. Mr. Atherton, in an elaborate attack upon this rule and other provisions of the Act in question, before the Society of Arts on the 16th of January, contented himself with a *mere reference* to the objects of his attack, in which course he was doubtless justified, as the persons interested in these matters are of course acquainted with their leading features.

Justice and good faith rather point out the *assailant*, as the person on whom the onus of placing fairly before the public the objects of his attack should fall, than those who merely concern themselves in their defence. We will, however, give a very brief outline of the rule for measuring sailing ships, so far as the main features of the application of Sterling's rule are concerned.

We need not inform our readers that a great deal of the phraseology in the description of the rule in the Act is rendered necessary for the purpose of *legally defining* the *points* from which the various measurements are to be taken, and would be required in the description of any rule. To introduce this legal phraseology would be unnecessary, as it possesses but little interest, except for those on whom the duty of taking the measurement falls.

There are five classes of ships created by this Act, according to the length of the tonnage deck measured as provided in the Act; and the tonnage deck is divided into a different number of equal portions for each.

The tonnage decks of these several ships are, (1) not exceeding 50 feet, (2) above 50 feet and not exceeding 120 feet, (3) above 120 feet and not exceeding 180 feet, (4) above 180 feet and not exceeding 225 feet, and, (5) above 225 feet: and they are divided (1) into 4, (2) into 6, (3) into 8, (4) into 10, and (5) into 12 equal parts. At each of these points (including the extremities) the depth is measured from one point to another, duly defined, and if the depth at the midship division of the length do not exceed 16 feet it is divided into 4 equal parts; if it exceed 16 feet, then it is divided into 6. The breadths are measured at each point of division, and also at the upper and lower points of the depth, and will hence be either 5 or 7 in number. In either case, the sums of the upper and lower breadths, of 4 times the breadths at the even points (calling the 1st point of division below the upper point the second) and of twice those at the odd places are added together and multiplied by one-third of the common interval between the points of division appropriate to the section, and the product gives the area of the transverse section. In this manner the areas of all the transverse sections are found. It is to be observed that the areas at the *extremities* of the tonnage deck are measured; and we have thus the areas of 5, 7, 9, 11, or 13 sections, according to the class of the ship calculated. The sums of the first and last of these areas, four times the even areas, and twice the odd areas, (exclusive of the first and last) are added together; and their sums multiplied by one-third of the common interval between the areas, gives the cubical contents of the space under the tonnage deck; and this divided by 100 gives the registered tonnage of the ship.

Poops and other closed-in spaces are measured on a similar principle, and applied to increase the tonnage, subject to certain well-defined and just provisions.

The only difference between the case of steamers and sailing ships is, that allowance according to fixed conditions is made for the space occupied by the engine and boilers. Whether that allowance should be made by a per centage as laid down by law, or by actual measurement, is a question with which we have no present concern. We are concerned in showing how the *principal provisions* of the clauses for tonnage measurement are connected with Sterling's rule: and on that point we think we have said as much as the occasion demands. Into the measurement of loaded ships by girting, it is not our province to inquire. In conclusion, we must remind Mr. Atherton that our criticism on his paper on tonnage appears in a *review*, and not in the communication of a correspondent, as he, altogether without reason, intimates; and we are, of course, responsible for that review.

ARTIFICIAL TEETH AND GUMS.

We have been favoured with an inspection of some artificial teeth and gums prepared by Mr. Truman, of Old Burlington-street, who has continued his experiments since 1848, in order to perfect the invention he then patented for the employment of gutta percha as a medium for holding and fixing artificial teeth in the mouth. The great difficulty has been to render the structures light, and at the same time strong enough to bear the great pressure which the gutta percha enables the wearer to exert during mastication, without hurting the gum. To obtain the strength required, recourse has been hitherto had to the use of heavy gold plates and strengtheners, to prevent the teeth being bitten off. Mr. Truman has now succeeded in combining both lightness and strength, by using aluminium to retain the teeth in their position, this metal being not more than one-tenth the weight of gold. The teeth—which we may here observe are prepared by Mr. Truman according to a process peculiar to himself—are a perfect imitation of natural teeth, and are strung on to the aluminium rod by peculiarly fitted loops, and then imbedded in gutta percha, which is fashioned to a cast of the gums. We extract the following from the specification of Mr. Truman's patent, filed on the 1st instant:—

"I take a stout wire, or a rod, or a bar of aluminium, and bend it to the shape required, in such a manner that the teeth when placed upon the bar, and embedded in the gutta percha, shall occupy those places in the jaw intended to be filled by artificial teeth.

"I prepare artificial teeth for securing to the aluminium holder by fixing in the back of each artificial tooth a loop or eye in such manner that the loop shall be in the same parallel line with the length of the tooth. Or I fix the loop or eye at the base of the tooth, a method I follow particularly for back teeth. I form the loop of platinum wire, and cause it to adhere by inserting the ends thereof, in the case of mineral teeth, into the mineral while in a soft state, and then bake them in a furnace. Or any other suitable metal may be used for the loop, and may be connected to the tooth by other means. The loop is found to correspond to the shape of the aluminium holder.

"Now, in order to finish the palates or holders, and fix the teeth thereon, I thread on to the aluminium holder as many artificial teeth (prepared with loops as aforesaid) as are necessary to cover the bases of the teeth, and surround the holder with suitably prepared gutta percha, applied in a heated, soft, and plastic state, in order to cause it to fill up the spaces and assume the form desired. I finish the whole by shaping the gutta percha over a cast of the gums for which the artificial teeth are required, and allow the gutta percha to cool, when the holder and teeth are ready to be fitted in the mouth."

A NOVEL NAUTICAL INSTRUMENT.

GRAY'S APPARATUS FOR INDICATING THE COURSE AND DISTANCE RUN BY A SHIP.*

Mr. W. D. Gray, master mariner, of London, has recently introduced a curious apparatus for indicating the course or direction and distance run by a ship. He employs outside the hull of the ship a fan or screw, placed below the keel, which fan or screw revolves with the action of the water as the ship moves through it. By means of an axle, cog-wheels, &c., it communicates a rotatory motion to a rod, which in its turn gives rotatory motion to a cylinder by another set of cog-wheels, and this cylinder is in contact with one end of a feeding tube, and has small cavities indented on its circumference. The apparatus is also furnished with a magazine for holding small shot, communicating with the other end of the feeder. The action of the apparatus is such that the shot are conveyed by a number of flexible tubes to a like number of bags suspended around the circumference of a disc, which disc is poised at its centre on a pivot, like the magnetic needle, so that it can incline or dip in any direction whenever a preponderance of shot in the bags may cause it to do so. On one surface is printed the points of the mariner's compass, and on it is also placed a small ball, which acts as an indicator to show the point of greatest inclination, which it does by its

* Patent dated September 28, 1855.

gravity, the disc having a raised edge to prevent the ball from rolling off. The point thus indicated is the course of the vessel, and the distance is obtained by ascertaining the force with which the said disc inclines, which is done by placing at the point exactly opposite the point of inclination a weight sufficient to balance the disc. A steel-yard is used to facilitate this operation.

NOVEL METALLIC BOATS AND MILITARY FLOATING WAGGONS.

A very interesting lecture was delivered at the United Service Institution, Whitehall-yard, on Saturday afternoon, by Major Vincent Eyre, F.R.G.S., of the Royal Artillery, on Metallic Boats and Military Floating Waggons, the invention of Mr. Francis, of the United States. Experiments have been tried at various places, with a view of testing the strength of the boats and waggons; and it has been ascertained, beyond doubt, that they are capable of standing the roughest service. One very remarkable proof of the usefulness of such boats is to be found in the fact, that when the material is penetrated by a gun shot, the damage can be repaired in a moment or two by means of a common hammer.

The structure of the boats may be briefly described. A sheet of copper or of galvanized iron, not thicker than a sixpence, is placed between two dies of the requisite form, which, by the aid of immense hydraulic pressure, at once compresses the sheet of metal into a boat, of the form, shape, and lines required, and at the same time impressed with certain longitudinal or fore and aft corrugations of a peculiar form, to which the boat is indebted for her enormous and astonishing strength. The preparation of the dies requires great care, labour, and expense; but once prepared, they will strike off boats without number, so that when once a factory is established, the boats are prepared at a very moderate cost. Dies are required for each boat, and different dies for each form and shape and size of boat, from the gig to the largest launch or cutter. Waggons for military purposes are constructed in a similar manner.

The qualities of boats and waggons may be thus enumerated:—"They are fireproof, waterproof, rotproof, and wormproof; they are also concussion proof; the boats may be left hanging at the davits during the heaviest firing."

The Emperor Napoleon, hearing of some very successful trials made with them, sent at once for Mr. Francis; and, after due investigation, approved the system, and ordered the establishment of a factory both for boats and waggons. He also presented Mr. Francis with an elegant gold snuff-box, which was handed round at the meeting.

PHOTOGRAPHY UNDER WATER.

In last week's number of the *Journal of the Society of Arts*, Mr. W. Thompson, of Weymouth, gives an account of the means he adopted for taking a photograph of the bottom of the sea in the Weymouth Bay, at a depth of three fathoms. The camera was placed in a box with a plate-glass front, and a moveable shutter to be drawn up when the camera was sunk to the bottom. The camera being focussed in this box on land for objects in the foreground, at about ten yards, or other suitable distance, was let down from a boat to the bottom of the sea, carrying with it the collodion plate, prepared in the ordinary way. When at the bottom the shutter of the box was raised, and the plate was thus exposed for about ten minutes. The box was then drawn into the boat, and the image developed in the usual manner. A view was thus taken of the rocks and weeds lying in the bottom of the bay. Mr. Thompson anticipates that it will be a ready and inexpensive means of arriving at a knowledge of the condition of piers, of bridges, piles, structures, and locks under water.

SAFETY-APPARATUS FOR BOILERS.*

An American invention for indicating and regulating the height of water in steam boilers has recently been patented in this country. It consists in adapting inside a boiler, or in suitable connection therewith, a hollow vessel in communication at the bottom with the water, and at top with the steam in the boiler. The vessel is also placed in communication with external signals, or with signals and apparatus whereby pumps may be set going and stopped. The vessel must be fixed in such manner that the level of the water therein when full shall be on a line with or below that in the boiler, and when such is the case no action takes place; but, as soon as the water in the boiler sinks below the level of that in the vessel, steam is generated or flows therein, and affords a power for working any suitable external signals, and, if desired, for putting pumps in gear to supply the deficiency in the boiler, and for stopping them on the proper level being attained. It is important that the supplementary vessel or apparatus be so placed, with respect to the boiler, that steam may be generated or admitted, and condensed therein or expelled therefrom, by the action of the steam and water in the boiler.

* Patent dated October 3, 1855.

DICKENSON'S IMPROVEMENTS IN PAPER.*

Mr. Dickenson, the inventor of the cylinder printing-machine, has recently introduced a method of manufacturing a paper which, by possessing on its opposite sides varying characters of surface, will permit of its being used indifferently for copper-plate or lithographic printing. For this purpose are brought together in a very wet state (that is to say, in an unfinished stage of manufacture) two webs of paper, as they are delivered from their respective machines, and these webs are combined into one by pressure, and are then dried and consolidated, so that they shall form one homogeneous web of paper. One of these webs is formed on what is known in the trade as the "Fourdrinier" or "Shaker" machine, and the other is formed on the cylinder machine. The arrangement of machinery which is employed in carrying out this new manufacture consists of a shaker machine, and a cylinder machine, combined with a suitable arrangement of felts and guide rollers, for traversing the two webs, and also of pressing rollers for expressing the moisture from the paper, and effecting the consolidation of the two webs into one.

GYMNASTICS FOR THE PEOPLE.

The Saxe Weimar Government intends to lay a moderate estimate before the Chambers in reference to the introduction of gymnastics into the superior educational establishments of the State. As most other German governments have taken the same course, it is not doubted that it will be also adopted in this instance. J. L.

A NOVEL BRANCH OF GEOLOGY.

The Vienna Mineralogical Museum has received lately from Athens eighty-seven specimens of *sub-fossil* remains of marine animals, collected between Kalamaki and Lukatri, 30 to 36 feet above the highest present *niveau* of the adjacent sea. All the species still live in the sea at present. J. L.

An Introduction to Entomology; or, Elements of the Natural History of Insects: Comprising an Account of Noxious and Useful Insects, of their Metamorphoses, Food, Stratagems, Habitations, Societies, Motions, Noises, Hybernation, Instinct, &c., &c. By William Kirby, M.A., F.R.S., F.L.S., Rector of Barham, and William Spence, Esq., F.R.S., F.L.S. Seventh Edition, with an Appendix relative to the Origin and Progress of the Work. London: Longman, Brown, and Co. 1856.

This is a new, enlarged, and cheap edition of the first portion of a work which has been growing in public favour for many years. It constitutes the best treatise in the English language on the manners and economy of insects—a subject which has by no means received, among mechanical persons especially, the attention which it merits. We know of no branch of Natural History so pregnant with interest for men whose business it is to deal with mechanical contrivances as Entomology. The common notion that insects are guided in their numerous and varied operations by a blind and limited instinct alone, is utterly false. On the contrary, no other living creature, save man himself, displays so great a fertility of skill and resource as that which the unnoticed insect frequently exhibits. If any of our readers doubt this, we refer them confidently to the volume before us. We have only space to add that the manner in which this popular edition is prepared is such that, at the published price, it is one of the cheapest scientific books in existence.

Practical Perspective. The Course of Lectures on Linear Perspective, delivered at, and forming a part of, the Instruction in the Training School, Marlborough House, and in the Schools of Art in connection with the Department of Science and Art. By R. Burchett, Head Master of the Training and Normal School. London: Chapman and Hall, Piccadilly. 1856.

Without losing sight of either of the treatises on perspective previously existing in the English language, we have no hesitation in saying, that a good practical and cheap work on the Science of Perspective was much needed before the publication of this volume. The above transcript of the title-page sufficiently explains the end for which it is designed. We are glad to be able to state that Mr. Burchett has executed his undertaking admirably. After a careful examination of much of the work, we feel confident that this is the case. A nice critic might certainly complain of a passage here and there—such as the following, for example, "Rays of light pass in straight lines from *all visible objects, however large*, to the small transparent surface of the eye," (which is true when the object and the observer are both situated in the same medium, as a perspective draughtsman and the object he delineates commonly are, but which is not true in numerous instances); and a hyper-critic might object to such curious and oracular statements as that a certain result "as might be expected, is more real than reality itself," and that while the "*physical* organs" "are two," "the organ of *mental vision*" "is one;" but these are matters which become insignificant when compared with the general merits of the work, which are suf-

* Patent dated Oct. 3, 1855.

ficient to render it a very valuable educational aid.

MECHANICAL LOCOMOTION.*

To the Editor of the Mechanics' Magazine.

Sir,—Your correspondent, "C.," in his last letter (page 398) says, that what he and probably the bulk of your readers desire is, to have it shown, "in clear and simple language, plainly and specifically, how the motive force moves the locomotive or boat, beginning at the point where the power is first impressed, showing the stages through which it passes, and at last tracing it up into the engine or train or boat, in the shape of an adequate propulsive force, actually operating upon the thing to be propelled."

This is a very reasonable desire, and if satisfactorily accomplished, it will put an end to the discussion which has taken up so much of your space lately. With your leave, I will do what I can to bring about a consummation so devoutly to be wished.

My remarks will be confined to the four-wheeled locomotive engine, considering it as a free body, containing the elements of a motive force.

The locomotive engine consists of a chemical apparatus for the generation of steam, and a mechanical arrangement (the engine, properly so called), by means of which the elastic properties of steam may be applied for the production of motion. These are rigidly combined, and are placed upon two points of support, namely, the axles of the wheels; each pair of wheels being keyed fast to their axle, may for our present purpose be taken as constituting but one mass, and one point of support for the engine and its steam generating apparatus.

The "locomotive" thus having contact with the road through its wheels at more points than one, fulfils the fundamental condition necessary for continuous locomotion, viz., that the locomotive machine must have at least one point of support besides that by means of which its progressive motion is effected. This condition is fulfilled even in the case of the American proposal, to place an engine within a drum to work like a squirrel in its cage—the drum travelling upon its periphery—and I believe it must, from the nature of things, hold good in every case of locomotion; yet it has not been recognised by any of the writers in the present controversy. The majority of the disputants get no further than the driving wheel, and lay themselves open to animadversion accordingly. "C." gets as far as the end of the cylinder, but gives it no support or abutment. Mr. Cheverton gives "C." a pole to propel himself with, while sitting upon a carriage; but he does not make the most of his illustration, although it correctly exemplifies the action of the locomotive engine, resting upon one pair of wheels, and propelling itself by means of another pair, called "driving wheels." There needs no other example to illustrate the law of mechanical locomotion which I have stated above.

It matters not which pair of wheels the engine rests upon or drives with—indeed, all the wheels may be coupled together; in effect the action will be as I have stated, the machine resting upon one or more of its supports, whilst it moves the others, just as a man in walking poises himself upon one foot while he advances the other; and if he keeps the same foot always in advance, bringing up the hinder one as he advances the front one, the analogy will be still more complete.

If any one object to the laws which I have enumerated, let him endeavour to construct a locomotive engine upon the axis of a single wheel, or two wheels keyed fast to the same axle. He certainly may in this way accomplish locomotion, but it will be only limited or temporary if his engine have no point of contact with any other body save the rails upon which it rests through its wheels, which, being upon the same axle, may be considered as forming but a single point of support.

An engine constructed thus may be made to oscillate so as to cause its wheels to travel a certain distance forwards and backwards alternately; but if the moving force be allowed to act in one direction only, the equilibrium of the engine being disturbed, it will turn round upon the axle and come to a state of rest beneath it, or keep up an oscillating motion merely.

In order to produce continuous locomotion in one direction, the machine must have a point of support and a point of impact for the force which is to propel it. Two wheels placed upon separate axles, the one in advance of the other, as in a velocipede, may be made to fulfil these conditions, provided the rims of the wheels are sufficiently broad to keep the machine upright; or the engine may rest upon a pair of wheels upon one axle, and thrust a pole against the ground, as in Mr. Cheverton's illustration; or this pole again may have a wheel at the end of it, and will still form a *point d'appui* for the action of the moving force, provided it be so loaded that the vertical pressure upon and consequent friction of the one wheel at the moment when the force im-

* No more of the letters on this subject which have hitherto been received will be published, and no additional ones that may hereafter be sent will be inserted unless they have great brevity for one of their merits.—Ed. M. M.

pinges upon it shall be greater than the corresponding pressure upon and friction of the other two wheels at the same moment. In order to sustain the motion, the weight upon the one wheel must be removed, so as to give preponderance to that part of the machine which rests upon the two wheels. The pole and its wheel must then be drawn up, the weight shifted upon them again, and the impulse repeated.

Although I am only describing a hypothetical machine, it may be mentioned that something of the kind was actually made, or at least talked about some years ago. The propelling machine rested upon the axle of a pair of wheels, and was connected with a third wheel by a "lazy tongs" arrangement. To produce forward motion the hinder wheel was drawn up close, and the wheel locked to the axle. The tongs were then extended, and the machine so propelled.

We are now, I think, in a position to consider the action of the elastic force of steam in the four-wheeled locomotive engine. We will consider the steam as already generated, and ready to enter the cylinder with sufficient elasticity to overcome the resistance opposed to the locomotion of the engine by the road. The steam admitted to the cylinder presses equally upon the face of the piston and the end of the cylinder. The cylinder is rigidly fixed to the body of the engine, and moves with it. The piston is a body free to move horizontally within the cylinder, independently of the body of the engine, in the direction of the length of that body.

If the body of the engine were extensible, the wheels of equal diameter, their respective friction equal both at the axle and on the road, and the cylinder placed between the two axles in such manner that the head of the cylinder should press against one of them, and the piston, by means of its rod, against the other, the result on the admission of the steam would be, that both ends of the engine, each with its pair of wheels, would be moved equally in opposite directions—a result of no use for the purpose of the engine, viz., continuous locomotion in one direction. In the case just stated the wheels would revolve in opposite directions. Now, instead of considering the body of the engine as extensible, take it, as it is, as a rigid body, and let the force of the steam act in the same way, namely, equally against both axles. In this case no motion will result, unless it be that of disruption.

Again, place the cylinder and piston lower than the axles, and let them press against points upon the vertical spokes of the wheels equidistant from their respective centres (*i. e.*, the centres of the wheels). No motion can then take place until the force of the steam becomes sufficiently great to overcome the resistance of the road acting against the periphery of the wheels. When this has been overcome the wheels will revolve to a certain extent in opposite directions—again a useless result for the purpose of locomotion.

Now place the cylinder and piston at such an inclination as will allow the force to press against the axle of one pair of wheels, and against a point (call it a crank pin) a certain distance from the centre of the other pair of wheels, vertically below the axle The action and re-action of the force being equal, say that the head of the cylinder is pressing against the axle with the same amount of force as that with which the piston-rod is pressing against the crank-pin. A struggle ensues. The contest is between equal forces, one acting on a roller, the other on a sledge. The wheels which have the pressure against their axle are free to revolve without slipping, by reason of the leverage afforded by the length of the spoke to overcome the resistance of the road. The other wheels having the pressure at a point between the axle and the road—say half way—have only half the liberty which the first pair have. One half of the force applied to them is expended in an endeavour to make the wheels slide upon the road from under the engine; the other half is a force of retardation: the force acting upon the first pair of wheels thus gains a preponderance to the extent of half its value, and becomes a force of propulsion, making use of the abutment furnished by the second pair in their endeavour to slide, and dragging the second pair along by means of their axle; the tractive force acting through the rigid body of the machine which connects the two axles together, so that they cannot travel separately.

This explanation completes one half of the case of locomotion exemplified in the four-wheeled locomotive engine. I think it may be understood without the aid of a diagram. It shows how futile is the attempt to solve the problem of "mechanical locomotion" by any investigation confined to the "driving-wheel." It is clear that when the crank-pin is below the centre, it merely supplies the abutment for propulsion, and the wheel itself, instead of "driving," is itself drawn along. What happens when the crank-pin is above the centre remains to be shown.

If the engine used for locomotion were only a single-acting one, the force of the steam impinging only upon one end of the cylinder, and one face of the piston, the inquiry need go no further than we have already carried it, there being no other motive action to seek, save that of the mo-

mentum of the whole engine, acquired by the single stroke of the piston in one direction. But the locomotive engine is a double-acting one. The piston is not content with thrusting, it must pull also; and now the "driving-wheel" becomes what its name implies as regards the machine, although as regards the steam, it can only be a "driven-wheel."

We will suppose the crank-pin of the driving-wheel to be placed vertically above the centre. The steam being admitted at the hinder end of the cylinder, and pressing equally against it and the hinder face of the piston, the force acting against the cylinder has to travel through the body of the engine to the axle of the driving-wheel before it can find an abutment, the force acting upon the piston pulls upon the crank-pin through the piston-rod. The end of the engine, with the cylinder attached, rests upon the axle of a pair of wheels, and the engine is thus capable of continuous forward motion, considering the cylinder as placed at the front. Provided then that the force of the steam be more than equal to the resistance of the road, it follows that in the contest of "cylinder versus piston," the force acting on the cylinder pressing against the axle of the driving-wheel and therefore having no tendency to make it revolve, whilst that acting upon the piston is connected with a point between the centre and the periphery of the wheel and has a tendency to cause the wheel to revolve, and as the wheel cannot revolve without moving the whole machine, whilst the friction at the point where its periphery is in contact with the road is sufficient to prevent it from slipping, the whole machine is moved accordingly. In this case the front wheels are pushed along by the rigid body of the engine, just as in the former case (with the crank-pin below the centre) the hind wheels were drawn along through the same rigid body.

Thus, with the aid of momentum to carry the crank over the dead points, and leaving out all consideration of gravity except that which is necessary to produce friction between the wheels and road, the whole motion of the locomotive engine is accounted for, in a very general manner it is true, but I hope satisfactorily.

In the simplest language that I can use, I have endeavoured to show that all locomotive machines must have more than one point of support in order to accomplish continuous locomotion in one direction, and that, therefore, an engine resting on the axle of a pair of driving-wheels only, can only oscillate, unless attached to some other body.

I have not examined the case of the boat, but Mr. Cheverton will readily see, as doubtless he already knows, that the boat resting on the water, and moved by means of a lever pressing against another part of the water, is analogous to that of the locomotive engine upon the road, and that this view supports his assertion in reference to the oar as a lever, in his first letter.

You, Mr. Editor, I expect to be especially grateful to me for having written a long letter upon "Mechanical Locomotion" without using the word "fulcrum," except in the last sentence.

I am, Sir, Yours, &c.

JAMES ROCK, Jun.

Hastings, April 29, 1856.

PAROCHIAL INSANITY!

THE INTENDED JOB AT THE MARYLEBONE FREE LIBRARY.

To the Editor of the Mechanics' Magazine.

SIR,—It was a good observation, made some months ago in your journal, that well-intentioned persons should not only *start* useful things, but look after them when so started. The Marylebone Free Library owes its existence chiefly to Lord Dudley Stuart and Mr. Joseph Hume, both of whom had collected considerable funds. It is strange that, when the situation of librarian and secretary was filled up, it was not one of the many Paternoster-row *hacks*, some of them men of talent and experience, who was selected for that post (worth, perhaps, £100 a-year), but a person connected with a foreign bookseller. However, I never saw the individual in his place, and when I presented a book to the library, I never got even an answer for it. Now, it seems, one of the cleverest jobs amongst the clever is likely to be played upon the ratepayers of the parish. It has been insinuated that, as the parish has now a local board, it may be rated for the maintenance, &c., of the library. The probable English (as I understand it) of this move is, that the *funds* hitherto subscribed will somehow disappear (!), and that, perhaps, moreover, some means will be devised by which the ratepayers will have to *re-buy* the present library. However, I still hope that the parish of Marylebone has some one *stronger* than I to stay this stunning and stupendous job.

I am, Sir, yours, &c.,

J. LOTSKY.

Parish of Marylebone,
May, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

SANDS, A. *Improvements in securing rails in railway chairs.* Patent dated October 2, 1855. (No. 2192.)

This invention consists in certain im-

proved modes of constructing vertical wedges and the blocks and chairs against which they act, for the purpose of securing the rails, or the ends of the rails, in the chair, and preventing the rising of the wedge.

PEAN, L. M. R. *An improved inkstand.* Patent dated October 2, 1855. (No. 2194.)

The patentee describes an inkstand furnished with a recipient, from which the ink is made to rush into a cup to supply the pen; by the action of the pen itself upon a loose cup, which causes an India-rubber piece to press on the air in the recipient.

RENNIE, G. *Improvements in steam-engine boilers as applied to the propulsion of vessels.* Patent dated October 2, 1855. (No. 2195.)

A description of this invention was given on page 437 of our last Number.

THRELFALL, R., and W. KNOWLES. *A certain improvement in looms for weaving.* Patent dated October 2, 1855. (No. 2196.)

This invention relates to the "taking-up motion" of looms for weaving, and is applied to the "taking-up" or ratchet wheel employed for taking up the cloth as it is woven, and consists in a new catch to be applied to the said ratchet wheel, in addition to the ordinary taking-up and holding-catches, for the purpose of regulating the recoiling motion.

BERNARD, J. *Improvements in the manufacture or production of boots and shoes, or coverings for the feet, and in the machinery or apparatus, and in the materials employed in such manufacture.* Patent dated October 2, 1855. (No. 2198.)

These improvements consist — 1. Of a mode of producing fastenings for uniting the soles and heels of boots and shoes to the uppers, and of an improved fastening for the same. It is proposed to make the fastenings from one continuous length of leather, or of fibrous and flexible material, such length being cut into separate shorter lengths after being inserted. 2. Of a machine which may be used by means of suitable gearing, in combination with any suitable mechanical arrangement, for presenting and holding the boot or shoe in proper and suitable positions to the piercing and inserting instruments, for the purpose of putting the sole and heel upon the boot or shoe. The third part of the invention relates to the use of an arrangement of machinery for imparting the several differential motions to the boot or shoe, and presenting and holding it at the required angles and positions during the making of the holes and inserting of the fastenings.

NEWTON, W. E. *An improved mode of constructing elastic bed-bottoms, applicable also to sofas, settees, and other seats.* (A communication.) Patent dated October 2, 1855. (No. 2199.)

Steel or other springs are attached to the slats at about one-third from their extremities, and the other ends of these springs are suspended from spiral springs, the other ends of which are hooked into staples in the side rails.

BENVENUTI, F. F. *Certain improvements in typography.* Patent dated October 2, 1855. (No. 2200.)

This invention consists in using two letters cast together so as to form one type; also of an improved apparatus for arranging and composing the type.

BOUSFIELD, G. T. *Improvements in locks for fire-arms.* (A communication.) Patent dated October 2, 1855. (No. 2201.)

This invention consists—1. In the use of a coiled wire-spring, for the purpose of throwing the hammer, as combined with the arbor which supports it, and with the parts immediately in connection therewith. 2. In supporting the spring at each end upon pins, one projecting from the face plate, and the other from the tumbler, whereby the spring is prevented from rubbing upon its arbor, and is free at all times to throw the hammer as required.

RAMSCAR, W. *Improvements in fire-arms, which improvements are also applicable to cannons and all kinds of field pieces.* Patent dated October 3, 1855. (No. 2204.)

In breech-loading fire-arms, the patentee dispenses entirely with percussion caps, and the ordinary lock outside the gun, by arranging a chamber under or within the piece, into which he places a valve or punch, so constructed as to be struck by a hammer every time the piece is fired. He makes the case of the cartridge of woven material, and, if desired, renders it impervious to moisture. An end of the cartridge case is fastened to a tube partly without and partly within the case. The tube is filled with gunpowder to within a small space at the end, into which is placed fulminating silver, so that when the hammer strikes the aforesaid valve or punch, the chemical compound ignites and discharges the piece.

BROOMAN, R. A. *A method of ascertaining or indicating and regulating the height of water in steam boilers.* (A communication.) Patent dated October 3, 1855. (No. 2207.)

A description of this invention is given on page 468 of this Number.

DICKENSON, J. *An improvement in the manufacture of paper.* Patent dated October 3, 1855. (No. 2208.)

A description of this invention also is given on page 469 of this Number.

WILKINSON, R. *Improvements in machinery or apparatus for carding cotton, wool, and other fibrous substances.* Patent dated October 3, 1855. (No. 2209.)

This invention consists in the employ-

ment of certain mechanism for the removal of dirt, &c., during the carding. The patentee employs a series of rollers, of uniform diameter, arranged partly around the carding cylinder, and operated upon by a brush and apparatus connected therewith.

OLDHAM, H. *An improvement in weaving textile fabrics.* Patent dated October 4, 1855. (No. 2212.)

This invention relates to an arrangement of the parts connected with the work-beam of power-looms. The work-beam is made to rotate at an uniform surface speed, produced by the use of a worm or screw working a nut which is made to regulate the position of the weight upon the ordinary weighted lever, so as to give to the weight an uniform and self-acting motion by it along the lever as the diameter of the work-beam decreases.

GRUET, G. F. *An improvement in the construction of lamps.* Patent dated October 4, 1855. (No. 2213.)

The object of this invention is to produce a lamp which may be used as a bracket lamp, or mounted upon a candlestick, and which, from having no internal parts, will not be liable to get out of order. The oil chamber consists of a small glass vessel, the mouth of which is inverted, and fitted into a copper, tin, zinc, or other tube, from which projecting at right angles, or nearly so, is a pipe, at the end of which is the burner and wick carrier.

LANCASTER, J. *An improved water-proof material.* Patent dated October 4, 1855. (No. 2214.)

Thin strips of wood, scale-board, cane, &c., are woven or plaited together; that is, a number of such strips are laid side by side so as to form what is called a warp (having been previously saturated with a solution of caoutchouc, gutta-percha, or a mixture of tar, lime, and resin, or other waterproofing composition), and into and across these strips a number of other strips are woven or plaited, either by hand or by suitable machinery, so as to form a weft. The fabric thus formed is next saturated with any of the waterproofing compositions before mentioned, and then passed through rollers, so as to press the whole together: or the fabric is formed of strips before they are saturated, and waterproofing composition applied after the weaving or plaiting is effected.

CORNFORTH, H. *A new or improved manufacture of hooks and eyes.* Patent dated October 4, 1855. (No. 2215.)

The said hooks and eyes are made of iron or steel wire, and afterwards coated with copper or brass, and then with silver. The coating with copper is effected by means of a solution of cyanide of copper, used at a boiling, or nearly boiling heat, in conjunction with an electrical current. The coating with silver is afterwards effected, by immersing the hooks and eyes in a solution of cyanide of silver, either with or without the application of an electrical current—with such a current if the coating is to be thick, and without it if the coating is to be thin.

RYLAND, T. H. *A new or improved manufacture of bracelets, and other dress ornaments, and ornamental dress fastenings.* Patent dated October 4, 1855. (No. 2216.)

This invention consists in the manufacture of such ornaments and dress fastenings as are usually made of jet, of horn, or hoof, or of substances employed in the manufacture of articles commonly called horn. The horn is stained or dyed, softened by heat, and pressed in dies to the required form.

MELDRUM, E., and J. YOUNG. *Improvements in the manufacture of certain salts of sodium and potassium.* Patent dated October 4, 1855. (No. 2220.)

This invention consists in manufacturing cyanides of sodium and potassium, by employing the metals instead of their oxides as heretofore.

DEMAIT, F. M. *Certain improvements in the preservation of animal and vegetable substances.* Patent dated October 4, 1855. (No. 2223.)

Taking meat for an example, it is cut into pieces, a string or hook is run through them, and they are hung on rods in a stove or chamber hermetically closed. A fire is lighted at the bottom, and the stove or chamber is heated from 60° to 104°. A preparation consisting of about 4 ounces of flour of sulphur, and about 2½ ounces of lime, with a handful of flowers or roots, and about half a handful of lemon leaves is thrown upon the fire. The stove or chamber is hermetically closed for about eighteen hours, at the expiration of which the door is opened, the meat is withdrawn, and afterwards suspended in a well-dried room in summer, or in a room gently heated in winter.

HALKETT, P. A. *Improvements in the application of motive power to, and in obtaining locomotion for the cultivation of land.* Patent dated October 5, 1855. (No. 2224.)

These improvements consist in applying the implements required for ploughing, scarifying, sowing, reaping, &c., by means of a travelling carriage moving on tramways or rails, or on paving or other manufactured ways, placed in parallel lines across the fields. Instead of making the rails or other bearing surfaces fixtures, the subway may alone be the permanent part, and may consist of lines of sleepers, on which the rails are laid down, and fitted so that they can be lifted and repeatedly laid in a similar position.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GEDGE, J. *Improvements in gas meters.* (A communication.) Application dated October 1, 1855. (No. 2177.)

It is proposed to use a transparent plate marked with the word "level," or to place a float on the water, with a valve and rod which will show, first the level, and then by an index the rise or fall. The supply pipe is to be made in form of a syphon, and to intercept the communication between the two branches by a little grating to prevent the fraudulent lowering of the water.

GEDGE, J. *Improvements in the preservation of grain.* (A communication.) Application dated October 1, 1855. (No. 2178.)

The inventor proposes to use a drum divided into compartments. The top of the drum holds the grain to the level of the first division, where the bottom is divided into a ridge and furrow, the trench of which is shut by means of small flaps, each attached to a movable axle, furnished with a chain of wheels, and set in motion by means of a lever, at the same time regulating the descent of the grain. When the flaps open the grain falls into the second compartment, after having passed over a double slope of wire cloth placed over boxes which receive the dust which is intermixed with the grain. The same operation takes place in each compartment, until the grain arrives in the reservoirs on the ground floor, whence it is shot into sacks, which are hoisted again to the top floor, and the process repeated.

WILKINSON, G. *Improvements in steering apparatus.* Application dated October 1, 1855. (No. 2182.)

The upper part of the rudder or rudder-post has fixed horizontally on it a cog-wheel with interior teeth, which do not extend all round. On a horizontal axis is fixed a portion of a two-threaded screw, of such diameter as to be equal to the interior diameter of the cog-wheel. The steering wheel is fixed on the axis of the screw. When one thread of the screw completes its action, the other thread comes into position, to prevent the rudder going over too far.

MITCHELL, J. *Improvements in apparatus for washing and amalgamating ores and other matters.* Application dated October 1, 1855. (No. 2183.)

Two troughs are formed side by side, parallel to each other, and are divided by a partition of such a height that the current of fluid, &c., may pass from trough to trough. In the two troughs are two screws revolving in opposite directions, or they are otherwise so made that the fluid in one trough is moved in an opposite direction to that in the other trough.

DEMING, J. H. *Improvements in the construction of projectiles.* (A communication.) Application dated October 1, 1855. (No. 2185.)

Each projectile is formed at its hinder part of a conical and hollow form, so as to expand when discharged, and combined therewith, at a more forward part of a projectile, is formed a cylindrical belt or band, which stands off from the body of the projectile, and is connected to the body by curved or screw-like arms, so that the projectile in passing through the air will thereby be caused to rotate.

DICKENS, T. *Improvements applicable to machinery for doubling and throwing silk and for doubling other fibrous materials.* Application dated October 1, 1855. (No. 2188.)

This invention relates to arresting the motion of spindles, should the threads become broken. A separate driving apparatus is used for each spindle; the threads, by their tension, support needles or other instruments in a definite position, but upon one or more becoming broken, the said instruments will assume another position, and cause a suitable disengaging apparatus to come into action.

CHADWICK, J. *Certain improvements in machinery for carding cotton and other fibrous materials.* Application dated October 2, 1855. (No. 2193.)

This invention consists in the application of a roller, covered with emery or other suitable material for grinding, to the cylinder of a carding engine, which roller, in revolving, serves to keep the wires of the cylinder sharp, or in working order, and free from dirt. It is preferred to make the emery roller revolve at a greater velocity than that of the cylinder, and to impart a lateral motion to it.

HORTON, W. *Improvements in the breech part of fire-arms.* Application dated October 2, 1855. (No. 2197.)

The nipple is applied in such a way that all angles are avoided from the percussion powder in the cap to the charge in the barrel, to increase the certainty of firing, and facilitate cleaning.

SCOTT, G. S. *Improvements in the manufacture of carbonate of soda.* Application dated October 2, 1855. (No. 2202.)

These improvements apply to the conversion of "vat liquor" into a solution of carbonate of soda, and consist in a new mode of applying carbonic acid gas, and is as follows: The "vat liquor," being placed in a strong close vessel, the carbonic acid gas is forced under pressure to enter into, and become combined with, the sulphuretted alkaline liquor, as in the manufacture of aërated waters, or soda water, whereby the carbonic acid combines with the alkali,

the solution is freed from its sulphur, which is precipitated, and the liquor is converted into a solution of carbonate of soda.

PEYTON, R. *An improvement in the manufacture of fences and gates where wrought iron is used.* Application dated October 2, 1855. (No. 2203.)

This invention consists in attaching the wrought iron bars or rods, which are to compose a fence or gate, to one another, by casting thereon, in suitable moulds, iron connections or junctions.

GREAVES, T. *Improvements in the method or means of obtaining and employing motive power.* Application dated October 3, 1855. (No. 2205.)

This invention consists of improvements upon a patent, dated 7th October, 1852, the specification of which describes the arrangement of a number of levers or pulleys, with weights and counterbalance weights affixed to a beam, so that motion being once given to them, they will continue to move by their own gravity, assisted by a water wheel.

PATTERSON, W., and G. PATTERSON. *Improvements in machinery or apparatus for moistening or damping woollen or other textile fabrics for finishing.* Application dated October 3, 1855. (No. 2206.)

The documents relating to this invention are with the law officers of the Crown.

NEWTON, W. E. *Improved machinery for separating gold and other metals from their ores.* (A communication.) Application dated October 3, 1855. (No. 2210.)

This invention relates mainly to the use of a metal basin which is supported at its centre by a ball and socket joint, and by a bed (over which it rolls) set below the basin, a rolling or rocking and gyrating motion being imparted to the basin by the revolving of the crusher-ball contained therein.

CROSSE, R. A. *Certain improvements in founding printer's type.* Application dated October 4, 1855. (No. 2211.)

This invention consists in having a series of letters or words upon each type, the words being cast on each end of the leads.

SANDERS, F. G., and T. R. SANDERS, jun. *Improvements in the manufacture of pottery, earthenware, and other clay articles.* Application dated October 4, 1855. (No. 2217.)

This invention consists—1. In producing fired clay in a pulverised form, and applicable to the manufacture of pottery and other clay articles. The clay is dried and, by means of a mill reduced to powder, and then placed in a kiln to be fired. The kiln is divided into compartments, the partitions being so arranged as to form a number of flues for the passage of the fire. Another improvement consists in covering with sheet iron the outside of the kilns used in the manufacture of pottery, &c. The invention also comprises a method of forcing a blast of air into such kilns, by means of a fan or otherwise.

HARDY, C. *Improvements in effecting communications between the guard and engine-driver, or between the various parts of a railway train.* Application dated October 4, 1855. (No. 2218.)

This invention consists of a system of tubing fitted to the carriages and provided with suitable mouth pieces, to be used as speaking tubes.

HAMILTON, W. *Improvements in the construction of tables, chairs, sofas, and other articles of furniture.* Application dated October 4, 1855. (No. 2219.)

To a piece of board forming a base, the patentee fastens the legs or stanchions of the pieces of portable furniture; these legs are made with rule joints, so as to fold down upon the base, and to their upper parts is screwed the table, seat, or other article of furniture. When in use, the joints of the legs are held by pins or clips, which prevent their contracting. Instead of rule joints telescopic tubes may be used.

BRIERLY, H. *Improvements in self-acting mules for spinning.* Application dated October 4, 1855. (No. 2221.)

These improvements refer to governing the winding on; in order to effect this, motion is given at intervals to certain parts of the machine through the agency of the faller, regulated by the tension of the yarn, if the operation be self-acting; for this purpose it is required that a connection shall be established between two parts, but in such manner that its arrangement may accommodate itself to different positions of the machine. This object is effected by the use of two or more rods or shafts, joined together so as to form varying angles to each other, but provided at the said joints with gearing or other apparatus for transmitting motion.

OVER, H. *A novel construction of gauge knife.* Application dated October 4, 1855. (No. 2222.)

This invention consists in constructing a knife which shall pare potatoes without waste. It is proposed to form it with a guard which will stand parallel to, and in front of, the knife edge, and gauge the depth of the cut, as in a spoke-shave. This guard is capable of shifting round the knife, or the knife blade is mounted loosely in the handle (to allow of its being shifted to suit the position of the guard) and fixed by a binding nut.

PROVISIONAL PROTECTIONS.

Dated January 17, 1856.

131. John Platt, of Oldham, Lancaster, mechanical engineer, and John Whitaker, of the same place, doubler. Improvements in machinery or apparatus for doubling or twining yarns or threads, parts of which improvements are also applicable to mules for spinning.

Dated April 15, 1856.

895. Hugo Frederick Forbes, of Park-place, Regent's-park, Middlesex, gentleman. Improvements in breech-loading fire-arms and ordnance, and in projectiles used therewith.

897. William Smith, of Aston, near Birmingham, Warwick, manufacturer. Improvements in the manufacture of steel wire for musical and other purposes.

899. Edmund Richard Southby, of Bulford Amesbury, Wilts. An improvement in coating iron with copper.

901. Joseph Demain, of Markington, York, agricultural implement manufacturer. An improvement in connecting railway carriages.

Dated April 16, 1856.

903. William Routledge, of Salford, Lancaster, Engineer. Improvements in the construction of steam engine and other boilers to prevent explosions.

905. Frederick Priestley, of Cleveland-street, Fitzroy-square, Middlesex, pianoforte manufacturer. Improvements in pianofortes.

907. Thomas Mellodew, of Oldham, Lancaster, manufacturer, and John Duxbury, of the same place, mechanic. Improvements in shuttles for weaving.

909. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved apparatus for raising sunken vessels and increasing the buoyancy of floating vessels. A communication. from Thomas Bell, of New York.

911. William Armitage, of Farnley Iron Works, and Henry Lea, manager to the Farnley Iron Company, both of Farnley, near Leeds, York. An improvement in the manufacture of iron.

913. William Wilkinson, of Hull, mechanic. Improvements in steam engines.

Dated April 17, 1856.

915. Henry Young Darracott Scott, of Brompton Barracks, Chatham, Kent, Captain R.E. An improved mode of manufacturing cement.

917. Lianna Mesure, of Billericay, Essex, watch manufacturer. An improvement in watches.

919. John Luntley, of Broad-street, London, printer. A new fabric or new fabrics suitable for wearing apparel and other purposes to which textile fabrics are applicable.

Dated April 18, 1856.

921. George Lurig, of Adelebsen, Hanover, now residing in Paris, soap manufacturer. Improvements in the process of manufacturing saltpetre.

923. William Tytherleigh, of Birmingham, Warwick, accountant clerk. A new or improved method of coating or covering iron or articles of iron with copper or alloys of copper.

925. William Budden, of Ipswich, Suffolk, bookseller. An improved method of preparing cheques, invoices, and other papers, so that they may be readily separated from their counterparts.

927. Thomas Hollingworth, of Turkey Mill, near Maidstone, Kent, paper manufacturer. Improved machinery for dusting or cleaning rags.

929. Edward Vincent Gardner, of Norfolk-street, Middlesex Hospital. Improvements in furnaces.

931. George Thompson, of Marchmont-street, Russell-square, Middlesex, gentleman. Improvements in instruments or apparatus used in drawing or marking with crayon, black-lead, or other such materials.

933. Peter William Barlow, of Great George-street, Westminster. An improvement in seasoning timber.

Dated April 19, 1856.

935. Claude Moret, of Rue de l'Echiquier, Paris. Improvements in rotatory steam-engines.

937. Thomas Blackburn, of Brighouse, York. cotton spinner. Improvements in preparing for spinning cotton-waste and silk-waste.

939. Charles Frederick Stansbury, of Gracechurch-street, London. A new instrument for determining the position and bearing of ships at sea. A communication.

941. Thomas Wilkes, of Birmingham, Warwick, manufacturer. A new or improved method of manufacturing tubes of copper and alloys of copper.

943. Robert Hazard, of Thanet-place, Strand, Middlesex, warming and ventilating engineer. A heat extractor for extracting the heat from the smoke or heated gases in its passage from boilers, stoves, or furnaces to the chimney, and rendering the economized heat available for drying and warming purposes.

Dated April 21, 1856.

947. Patrick Heyns, of Poplar, Middlesex, cooper. Improvements in railway wheels.

949. Samuel Mellor, of Salford, Lancaster, mechanic, and Thomas Young, of Manchester, tobacco manufacturer. Certain improvements in machinery for supplying water to steam-boilers.

951. William Owen, of Lincoln's-inn-fields, London. Improvements in the modes of attaching buttons to wearing apparel.

953. William Maughan, of Ifield-terrace, Stockwell, Surrey. An improvement in the preparation or manufacture of starch.

Dated April 22, 1856.

955. William James Cantelo, of Southwark, Surrey, gentleman. Improvements in the preservation of vegetable matters.

957. Alexander Symons, of George-street, Mansion House, London, and Edward Burgess, of Clerkenwell-green, Middlesex. Improvements in instruments for ascertaining and indicating heat, and also in the parts for making and breaking contact in electric circuits used therewith.

959. Augustin Simeon Vimont, practical engineer, of Vire (Calvados), France. A new system of machine for spinning wool and any other fibrous material.

961. Peter Brown, of Liverpool, Lancaster, corn merchant, and George Brown, of the same place, corn merchant. Improved apparatus applicable to furnaces, fire-grates, fire-places, or stoves, for the purpose of economizing fuel and heat.

963. Christopher Nickels, of Albany-road, Camberwell, Surrey, and James Hobson, of Leicester. An improvement in machinery for weaving carpets and terry fabrics.

965. Thomas Jeacock, of Bridge-street, Leicester. An improvement in knitting machinery.

967. William George Armstrong, of Newcastle-upon-Tyne, Northumberland, civil engineer. Improvements in apparatus for lifting, lowering, and hauling.

Dated April 23, 1856.

971. Adam Bullough, of Blackburn, Lancaster, manufacturer. Improvements in looms.

973. William Peacock Savage, of Roxham, Norfolk, farmer. A machine for drilling and rolling land.

975. John Shae Perring, of Radcliffe, Lancaster, civil engineer. Improvements in chairs for railways.

977. James Barbour, of Glasgow, Lanark, North Britain, joiner. Improvements in sawing apparatus.

979. David Brown, of Smethwick, Stafford, machinist. A new or improved method of joining the rails of railways.

Dated April 24, 1856.

981. Abel Désiré Schratz, of Saint Denis, near Paris, France, chemist. Improvements in preparing colours for the impression of woven or textile fabrics or stuffs of any kind.

982. John Yeomanson and William Yeomanson, of Leicester, manufacturers of hosiery. Improvements in the manufacture of knitted fabrics.

983. Thomas Woodcock and John Killingworth Punshon, of Great Ormond-street, Middlesex. A machine for cutting and slicing bread and other substances.

984. George Ashworth, of Sunny-bank Mills, Rochdale, Lancaster, woollen manufacturer. Improvements in machinery for preparing slivers or slubbings of wool and other fibrous materials, commonly called condensing carding engines.

985. Charles Cowper, of Southampton-buildings, Chancery-lane, Middlesex. A new yarn or thread, and its application in the manufacture of stockings, gloves, and looped and other fabrics. A communication.

986. Pennell Allman, of Cambridge-terrace, Hyde-park, London, consulting engineer, and Donald Bethune, of the same place, esquire. Certain improvements in apparatus for the production of steam, and in the apparatus employed in its application to motive purposes.

987. Victor Doat, of Albi, France, gentleman. An improved galvanic battery and method of recovering and revivifying the agents employed.

988. Walter Neilson, of Glasgow, Lanark, North Britain, engineer. Improvements in locomotive engines.

989. Frank William Blackett, of West Smithfield, London, draper. An improvement in the construction of keys and locks, and in the fitting of locks, to afford increased safety.

990. Thomas Moore, of Retford, Nottingham, engineer. Improvements in machinery for riddling and winnowing or cleaning corn and other grain.

Dated April 25, 1856.

991. William Naar, of Glasgow, Lanark, N.B., upholsterer. Improvements in folding or adjustable articles of furniture.

993. James Hardacre, of Manchester, Lancaster, engineer. Improvements in the arrangement and construction of carriages and carriage wheels.

994. Charles Swift and John James Derham, of Blackburn, Lancaster, engineers. Improvements in steam engines.

995. Isaac Daniel Fraétaniel, of Paris, France, proprietor. An improved safety rein or bridle.

996. William Gossage, of Widnes, Lancaster, chemist. Improvements in the manufacture of sulphuric acid.

Dated April 26, 1856.

998. Thomas Hill, of Heywood, Lancaster, boiler manufacturer. Improvements in steam boilers and furnaces connected therewith.

1000. Edmund Topham, of Mansfield-road, Nottingham. Apparatus for cleansing out the sediment from the water in steam boilers and preventing incrustation of the same.

1002. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery for manufacturing painted or enamelled cloth. A communication.

1004. Thomas Walker, of Warwick-place, Pimlico, Middlesex. Improvements in playing cards.

1006. Thomas Heiffor, of Sheffield, York, manufacturer. An improved method of manufacturing razor blades.

Dated April 28, 1856.

1008. Jean Charles Bertrand Dubos, chemist, of Paris, French Empire. An improved electro-magnetic apparatus.

1010. Henry Geering, of Birmingham, Warwick, bedstead smith. An improvement or improvements in metallic bedsteads, chairs, couches, and other articles for sitting, lying, or reclining upon.

Dated April 29, 1856.

1012. Charles Joseph Graftiaux, of Molenbeck St. Jean by Brussels, Belgium, mechanician. Improvements in rotatory steam engines.

1014. James Stead Crosland, of Openshaw, near Manchester, engineer. Certain improvements in furnaces and steam generators for locomotive steam engines and other purposes.

1016. Charles Titterton, of Roehampton, Surrey. An improvement in the manufacture of white zinc.

1018. Isaac Abraham Boss, of Bury-street, London. Improvements in preparing cane, in order to render it suitable to be used as a substitute for whalebone. A communication.

1020. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in anchors. A communication from Louis Frederic François David, of Havre, France, chain manufacturer.

Dated April 30, 1856.

1022. Francis Gybbon Spilsbury, of Chaudfontaine, Belgium, and of Southwark, gentleman. Separating metals, metallic oxides, and metallic acids from their ores.

1024. Joseph Rigby, of Ashton-under-Lyne, Lancaster, mechanic. Improvements in machinery for grinding or sharpening the card cylinders and rollers of carding engines.

1026. Wright Jones, of Pendleton, Lancaster, engineer. Improvements in apparatus for regulating the pressure and flow of steam water and other fluids.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," May 13th, 1856.*)

2948. George Royds Birch. A form and folding desk combined, adapted for the use of schools.

2956. Archibald Turner. Improvements in the manufacture of looped fabrics.

7. John Thurrell, Elizabeth Mary Muller, and John Robert Chidley. Improvements in transmitting fac-simile copies of writings and drawings by means of electric-currents.

18. William Alfred Distin. Improvements in pipes for smoking.

22. John Henry Johnson. Improvements in apparatus or means for facilitating the performance of church and other music on organs, harmoniums, pianos, and other similar keyed musical instruments. A communication.

23. Alan Stewart. Improvements in measuring the human figure, and in fitting garments thereto.

35. Thomas Key. An improved knife-cleaning machine.

39. Joseph Betteley. An improvement in the rolling of iron for the making of ships' knees.

48. Joseph Corbett. A new or improved method of preserving the tuyeres of blast-furnaces.

52. Charles Jarvis and Thomas Deykin Clare. A new or improved oven or kiln to be used in the manufacture of coke and pottery, and for heating and drying generally.

54. Thomas Barter. An improved apparatus for administering vapour and douche baths.

62. Henry Stuart and Thomas Pritchard. Improvements in watches and chronometers, which improvements are also applicable to clocks and other time-pieces.

69. William Barrie. An improved reflective leveller. A communication.

71. John Ashworth, junior. Certain improvements in lap machines or apparatus used in the preparation of cotton and other fibrous substances for spinning.

77. Martin Billing and Frederick Augustus Harwood. New or improved machinery for the manufacture of paper bags.

96. Alexandre Tolhausen. Certain improvements in balance slide valves for steam engines. A communication.

103. John Gottlieb Ullrich. Improvements in chronometers and other time-keepers.

107. Pierre Théophile Auguste Nicoulland. Improvements in steam-boiler furnaces. A communication.

109. Samuel Sheppard. A new or improved tap or stop cock.

116. John Abraham. New or improved machinery for the manufacture of percussion caps, and for cutting out and raising articles in metal generally.

197. Félix Chauchard. Improvements in the manufacture of paper and pasteboard from vegetable and wood substances.

216. Samuel Statham. Improvements in electric-telegraph conductors.

255. John Gretton. Improvements in brewing.

290. John Rock Day. A new or improved door-lock and latch.

329. James Meacock. An improved means of fixing diaphragms in gas-meters.

409. Moss Defries. An improvement in supplying oil to the burners of lamps.

452. John Sharp Cromartie Heywood and George Lloyd. Improvements in condensing vapours in distillatory operations, the manufacture of varnishes, melting and distilling of fats and other manufacturing or chemical operations, and obtaining useful products therefrom.

464. George Holme Spencer. Improvements in the manufacture of card surfaces employed in carding cotton and wool.

478. Robert Hawthorn and William Hawthorn. An improved arrangement of steam pump.

643. Edward Rowley and John Hadley. A new or improved method of shaping iron.

737. Allen Levinston Hill. Improvements in furnaces for steam boilers, japanners' stoves, and other such like purposes.

740. William Frederick Thomas. Improvements in sewing-machines.

753. Charles Wye Williams. Improvements in the application of air propelling or exhausting apparatus for ventilating and like purposes on board steam vessels.

758. James Eives. A new mode of preparing fibres from plants. A communication.

815. Charles Durand Gardissal. The treatment or preparation of fabrics or textile materials to be dyed or printed. A communication.

861. Henry Laxton. An improved mode of adjusting circular saws. A communication.

871. George Jackson. A new or improved steam boiler, to be heated by the waste heat of puddling or mill furnaces.

876. Robert Stirling Newall. Improvements in telegraphic insulators.

897. William Smith. Improvements in the manufacture of steel wire for musical and other purposes.

899. Edmund Richard Southby. An improvement in coating iron with copper.

905. Frederick Priestley. Improvements in pianofortes.

908. Alfred Vincent Newton. Improvements in fire-arms and powder-flasks. A communication.

915. Henry Young Darracott Scott. An improved mode of manufacturing cement.

917. Lianna Mesure. An improvement in watches.

931. George Thompson. Improvements in instruments or apparatus used in drawing or marking with crayon, black lead, or other such materials.

941. Thomas Wilkes. A new or improved method of manufacturing tubes of copper and alloys of copper.

947. Patrick Heyns. Improvements in railway wheels.

953. William Maugham. An improvement in the preparation or manufacture of starch.

963. Christopher Nickels. An improvement in machinery for weaving carpets and terry fabrics.

976. William Henry Balmain and Thomas Colby. Improvements in the manufacture of alkalies from their sulphates.

987. Victor Doat. An improved galvanic battery, and method of recovering and revivifying the agents employed.

988. Walter Neilson. Improvements in locomotive engines.

996. William Gossage. Improvements in the manufacture of sulphuric acid.

1020. John Henry Johnson. Improvements in anchors. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

1853.

1135. John Fisher.
1136. David Law and John Inglis.
1140. Thomas Quaife.
1143. John Clapham, Thomas Clapham, and William Clapham.
1144. Thomas Murray.
1157. Samuel Cunliffe Lister.
1167. Edmund Whitaker and James Walmsley.
1175. Joseph Denton.
1190. George Fitz James Russell.
1194. Thomas Stephen Holt.
1196. Herman Dirs Mertens.
1203. John Drumgoole Brady.
1204. Robert Walter Swinburne.
1232. William Gossage.
1287. William Haslett Mitchel.

LIST OF SEALED PATENTS.

Sealed May 6, 1856.

473. Charles Brook, the younger, and Joseph Hirst.
508. Edward Ellis Allen.
533. Alfred Francis.
535. Cyprien Marie Tessié du Motay and Jean Jaques Fontaine.
553. George Lodge, the elder, John Ogden, and George Lodge, the younger.

Sealed, May 9, 1856.

2551. Fischer Alexander Wilson.
2560. Henry Laxton.
2561. James Burrows.
2575. Franz Duncker.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

The publication of the letters of Messrs. C. Wye Williams, E. V. Gardner, and J. Pitter, is deferred.

H. M'Cormac.—Your paper on cheap food is received with thanks.

H. J. Warin.—Your geometrical demonstration shall be inserted shortly.

CONTENTS OF THIS NUMBER.

Cowburn's Improved Boilers and Valves—(*with engravings*) ... 457
Faraday's Experimental Researches in Electricity—(*continued from page* 391) ... 459
On Large Bells and Bell Machinery—(*with an engraving*) ... 461
Tonnage Admeasurement ... 465
Artificial Teeth and Gums ... 467
A Novel Nautical Instrument: Gray's Apparatus for Indicating the Course and Distance run by a Ship ... 467
Novel Metallic Boats and Military Floating Waggons ... 468
Photography under Water ... 468
Safety Apparatus for Boilers ... 468
Dickenson's Improvements in Paper ... 469
Gymnastics for the People ... 469
A Novel Branch of Geology ... 469
An Introduction to Entomology. By W. Kirby, M. A., and W. Spence, F.R.S. (*Review*) ... 469
Practical Perspective. By R. Burchett—(*Review*) ... 469
Mechanical Locomotion ... 470
Parochial Insanity! The Intended Job at the Marylebone Free Library ... 472
Specifications of Patents recently Filed :

Sands	Permanent Way	472
Pean	Inkstand	473
Rennie	Boilers	473
Threlfall and Knowles	Looms	473
Bernard	Boots and Shoes	473
Newton	Elastic Bed-bottoms	473
Benvenuti	Typography	473
Bousfield	Fire-arms	473
Ramscar	Fire-arms	473
Brooman	Boilers	473
Dickenson	Paper	473
Wilkinson	Carding-machinery	473
Oldham	Textile Fabrics	474
Gruet	Lamps	474
Lancaster	Waterproof Material	474
Cornforth	Hooks and Eyes	474
Ryland	Bracelets	474
Meldrum & Young	Alkaline Salts	474
Demait	Preserving Substances	474
Halkett	Agricultural Apparatus	474

Provisional Specifications not Proceeded with:

Gedge	Gas Metres	475
Gedge	Preserving Grain	475
Wilkinson	Steering Apparatus	475
Mitchell	Washing Ores	475
Deming	Projectiles	475
Dickens	Fibrous Materials	475
Chadwick	Carding Machinery	475
Horton	Fire-arms	475
Scott	Carbonate of Soda	475
Peyton	Iron Fences	476
Greaves	Motive Power	476
Patterson and Patterson	Damping Fabrics	476
Newton	Separating Metals	476
Crosse	Printers' Type	476
Sanders and Sanders	Pottery	476
Hardy	Railway Signals	476
Hamilton	Folding Furniture	476
Brierly	Self-acting Mules	476
Over	Gauge Knife	476

Provisional Protections ... 477
Notices of Intention to Proceed ... 478
Patents on which the Third Year's Stamp-Duty has been Paid ... 479
List of Sealed Patents ... 480
Notices to Correspondents ... 480

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1711.] SATURDAY, MAY 24, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

CHADWICK'S PATENT WATER METER.

Fig. 1.

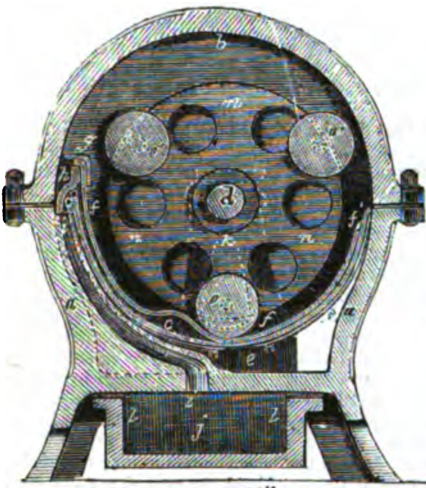


Fig. 2.

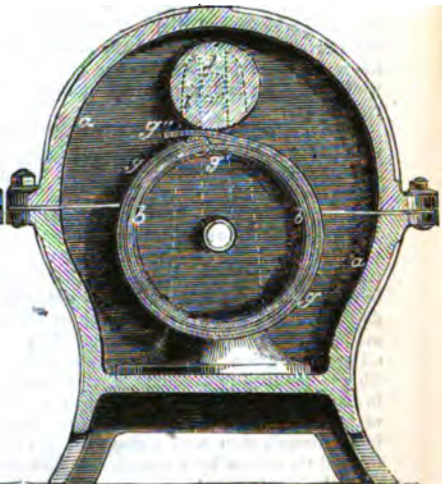


Fig. 3.

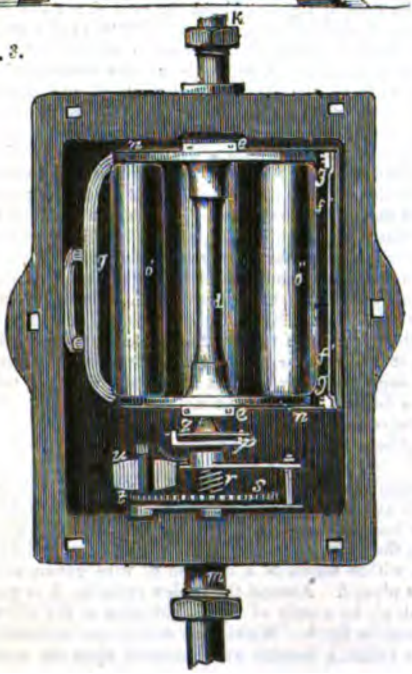
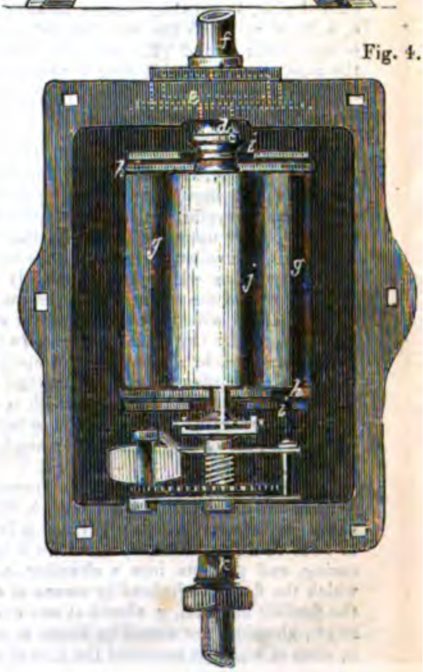


Fig. 4.



CHADWICK'S PATENT WATER METER.

On the 31st of March, 1853, an improved water meter, possessing very excellent qualities, was patented by Mr. George Hanson, plumber, of Huddersfield, and Mr. David Chadwick, of Salford, who is well known to the public. This meter may be described as follows:—It consists of two flat semicircular bags of vulcanized India-rubber, in which the water is in the first instance received, a wire gauze or sieve being introduced between the supply pipe and the two inlet passages. At the other extremities of the bags there are openings which allow the water to pass into the meter. The water, on entering these bags, sets in motion three conical rollers attached to a centre spindle in connection with the counting wheels and dial. These rollers are kept constantly revolving, each revolution registering exactly the contents of the bags. Each bag is kept constantly distended with the water it receives, and, as one of the rollers is constantly in advance of the ontlet valve, whilst another is immediately behind it, the quantity discharged is kept up with great regularity.

This meter has subsequently been improved by the original patentees, in conjunction with Messrs. John Chadwick, and Herbert Frost, of Manchester. It is represented in its improved form by the engravings on the preceding page, in which two novel methods of using the flexible bags are exhibited. The first of these is shown in sectional view at fig. 1, and in plan view at fig. 2, the upper part being removed in order to expose the parts. The casing is shown at *a, b*, within the lower portion of which is fixed a metal plate, *c*, with parallel edges, the surface being curved so as to be concentric with an axis, *d*, the extremities of which are mounted in slots formed within standards, *e*, situate within the casing, and beyond which the said axis does not extend; it is, therefore, entirely enclosed, and bears downward by its own gravity. Upon the plate, *c*, is adapted a rectangular piece of flexible material, *f*. (The one now employed by the patentees is substantial leather prepared with oil or other grease; but other substances, such as India-rubber cloth, may be employed.) This is confined to the plate, *c*, at its sides, and at one end by means of a narrow strip of brass, *g*; the other end, *f'*, is open across its width to the interior of the casing. The plate, *c*, is furnished with an aperture, *h*, leading to a passage, *i*, the lower end of which is in communication with a chamber, *j*, to which a pipe, *m*, is adapted, the orifice being divided therefrom by a partition of wire gauze, *l*. On the opposite side of the casing is a second pipe, *k*, opening thereto, as seen by dots in fig. 1. Upon the axis, *d*, are two discs, *n, n*, between which are mounted rollers, *o, o', o''*, bearing as they revolve upon the surface of the elastic bag, *f*. The water or other fluid or gas to be measured is admitted through the pipe, *m*, and after passing through the wire gauze, *j*, proceeds up the passage, *i*, and through the orifice, *h*, into the space between the flexible material, *f*, and plate, *c*. According to the position shown, it is there exerting a pressure against the roller, *o*; but as the casing is also full of fluid, the pressure on the other side will be equal, and therefore no alteration in the position will take place: but suppose a drawing off to be effected through the pipe, *k*, then the equilibrium will be destroyed, and the roller, *o*, will be forced forward. This movement will bring the roller, *o'*, past the orifice, *h*, and a certain quantity of fluid will therefore be enclosed between the said rollers, *o* and *o'*, which will be discharged into the casing upon the former having passed the open end, *f'*, of the flexible material, *f*. After this, the roller, *o''*, will pass the orifice, *h*, to perform the same office, and so on, successive volumes, which are practically definite and constant in quantity, being enclosed between two of the rollers, and subsequently liberated at the orifice, *f'*. Each revolution of the shaft, *d*, will therefore represent a certain quantity of fluid drawn off, and this may be registered by any ordinary count. In the engravings the shaft, *d*, is shown connected to a second shaft, *p*, by a clutch *q*, and upon it is a worm, *r*, supposed to be connected to the usual train of index wheels. Upon this supplementary shaft is mounted a wheel, *s*, taking into a pinion, *t*, on the axis of which is a fan, *u*. During the action of the meter, therefore, this apparatus will be caused to revolve rapidly, and effect a steadiness of action. If desired, a tube or bag of flexible material may rest upon the plate, *c*, instead of the disc, *f*, above described.

Fig. 3 represents the second improvement, in section; and fig. 4 is a plan view thereof. Within the casing, *a*, is a cylinder, *b*, the axis at one end thereof being connected to the count, as before. At the other end it is hollow, and provided with a conical end, *c*, ground so as to fit a short tube, *d*, by which it is therefore supported. This tube is carried by the casing, and projects into a chamber, *e*, within which is a division of wire gauze, and to which the fluid is admitted by means of a pipe, *f*. Around the hollow cylinder, *b*, is wound the flexible material, *g*, closed at one end, *g'*, by a strip of metal, but open at the other, as at *g''*; the sides are closed by rings, *h*, seen in fig. 4. Within the casing are standards, *i*, in slots of which is mounted the axis of a roller, *j*, bearing by its gravity upon the surface

of the bag, *g*. Fluid entering by the pipe, *f*, will pass through the tube, *d*, into the cylinder, *b*, and from thence through an orifice, *l*, into the space between the outward surface of the said cylinder and the flexible material, *g*; there it will exert its force against the roller, *j*, which acts as an abutment, and upon a portion being drawn off, will cause a revolution of the cylinder, *b*. This movement will bring the open end, *g''*, beyond the point of contact of the roller, *j*, and through which the fluid will then issue into the casing, *a*.

The above arrangements are particularly described in reference to meters, but the same are also applicable as motive power engines to be worked by water or other means. In such cases the counting wheels and outer casing will, of course, be dispensed with, power being obtained from the shaft, *d*, and the parts will be constructed of suitable strength, according to the strain to which they are intended to be subjected.

It may be added, that these meters (to which, at the head of this article, we have, for the sake of convenience, applied the name of that one of the joint patentees who is best known to the public), in their improved form, have been fully at work above five months, and have been found to work well, and prove perfectly satisfactory in every respect: they measure, with equal certainty and exactness, at the rate of one gallon per hour, and at any variation up to the maximum speed of the meter. Upwards of 300,000 gallons of water have been passed through one of the half-inch meters, and no appreciable wear and tear, or depreciation whatever, is perceivable in it.

EXPRESSION OF DEFINITE INTEGRALS AND DIFFERENTIAL COEFFICIENTS, BY MEANS OF SYMMETRICAL FINITE DIFFERENCES.

BY CHARLES W. MERRIFIELD, ESQ.

THE symbolical equations by which differentiation and integration are compared with finite differences and summation, namely:

$$h^m \frac{d^m u}{dx^m} = \left\{ \log (+\Delta) \right\}^m_{u,} \quad h^{-m} \int^m u\, (dx)^m = \left\{ \log(1+\Delta) \right\}^{-m} u$$

have long been known. The obvious mode of expansion in terms of Δ^n was felt by Legendre to be attended with some inconvenience, from the series not having sufficiently converging coefficients. He therefore expanded the expression, not in terms of Δ, but of $z = \frac{\Delta^2}{1+\Delta}$. He has, however, left a gap in the system, which I have felt as a hindrance, and have succeeded in supplying.

Legendre's method, which he explains with some prolixity (Fonctions Elliptiques, vol. ii. ch. iii.) may be established as follows: Making $z = \frac{\Delta^2}{1+\Delta}$ and therefore $\Delta = \frac{1}{2} z + \sqrt{z + \frac{1}{4} z^2}$, we have:

$$\log (1+\Delta) = \log\left\{1 + \tfrac{1}{2} z + \sqrt{z + \tfrac{1}{4} z^2}\right\}$$

$$= \int_0^z \frac{1}{2\sqrt{z}} (1 + \tfrac{1}{4} z)^{-\frac{1}{2}}\, dz$$

$$= \sqrt{z} \left\{ 1 + \tfrac{1}{2} \frac{z}{3.2^2} + \frac{1.3}{2.4} \frac{z^2}{5.2^4} - \frac{1.3.5}{2.4.6} \frac{z^3}{7.2^6} + \ldots\ldots\ldots \right\}$$

Representing the *m*th power of the series in $\{\ \}$ by

$$1 + M_1 z + M_2 z^2 + M_3 z^3 + M_4 z^4 + \ldots\ldots\ldots$$

and restoring $\Delta(1+\Delta)^{-\frac{1}{2}}$ in place of z, we obtain

$$\frac{\Delta^m U}{(1+\Delta)^{\frac{m}{2}}} + M_1 \frac{D^{m+2} U}{(1+\Delta)^{\frac{m}{2}+1}} + M_2 \frac{\Delta^{m+4} U}{(1+\Delta)^{\frac{m}{2}+2}} + \ldots\ldots\ldots$$

which we have to interpret.

Denote the successive values of u by $\ldots\ldots U_n \ldots\ldots U_2, U_1, U$ or $u, u_1, u_2, u_3, \ldots\ldots u_n$, in which $u = \phi(x)$, $u_n = \phi(x+nh)$, $U_n = \phi(x-nh.)$ Then the scale of relation is

$U_n = \frac{u}{(1+\Delta)^n}$, $u_n = (1+\Delta)^n u$. If we also denote $u_{\frac{1}{2}}$ or $\phi(x+\frac{1}{2}h)$ by V or v, we have a parallel scale $V_n \ldots\ldots V_1$, V or v, v_1, $v_2 \ldots\ldots v_n$ with the same relation between its successive terms, and, for its connecting relation with the other scale, $V_r = (1+\Delta)^{\frac{1}{2}} U_r$.

If m be even $(=2n)$, we obtain, by direct substitution

$$\left\{ \log (1+\Delta) \right\}^{2n} u = \Delta^{2n} U_n + M_1 \Delta^{2n+2} U_{n+1} + M_2 \Delta^{2n+4} U_{n+2} + \ldots\ldots\ldots$$

If m be odd $(=2n+1)$, we have

$$\left\{ \log (1+\Delta) \right\}^{2n+1} U = \Delta^{2n+1} V^n + M_1 \Delta^{2n+3} V_{n+1} + M_2 \Delta^{2n+5} V_{n+2} + \ldots\ldots$$

The values of the coefficients are as follows

$$M_1 = -\frac{m}{24},\ M_2 = \frac{m}{2^7.3^2.5}(5m+22)$$

$$M_3 = -\frac{m}{2^{10}.3^4.5.7}(35m^2+462m+1528)$$

$$M_4 = \frac{m}{2^{15}.3^5.5^2.7}(175m^3+4620m^2+40724m+119856)$$

and by giving m any positive or negative value, the series for any differential coefficient or integral may be at once found.

In practice, however, there is frequently a difficulty, in using the series where m is odd, from the values of V, V_1, V_2, &c., not being obtainable without a distinct interpolation, where the values U, U_1, U_2, U_3, &c., only are given. When m is even, the converse may be the case. I have obviated this by using mean differences, as follows:

Making $z = \frac{\Delta^2}{1+\Delta}$ as before,

$$\frac{2}{2+\Delta} = (1+\Delta)^{-\frac{1}{2}} \left\{ 1 - \frac{1}{2}\frac{z}{4} + \frac{1.3}{2.4}\,\frac{z^2}{4^2} - \frac{1.3.5}{2.4.6}\,\frac{z^3}{4^3} + \ldots\ldots\ldots \right\}$$

Combining this with the previous expressions, we get

$$\frac{2}{2+\Delta}\left\{ \log (1+\Delta) \right\}^{2n} u = \frac{\Delta^{2n}}{\sqrt{1+\Delta}} U_n + N_1 \frac{\Delta^{2n+2}}{\sqrt{1+\Delta}} U_{n+1} + N_2 \frac{\Delta^{2n+4}}{\sqrt{1+\Delta}} U_{n+2} + \ldots\ldots\ldots$$

$$= \Delta^{2n} V_n + N_1 \Delta^{2n+2} V_{n+1} + N_2 \Delta^{2n+4} V_{n+2} + \ldots\ldots\ldots$$

N_1, N_2, N_3 being a different set of coefficients.

Now, since $(2+\Delta)V_n = V_n + V_{n-1}$,

$$\left\{ \log (1+\Delta) \right\}^{2n} u = \frac{1}{2}(\Delta^{2n} V_n + \Delta^{2n} V_{n-1}) + \frac{1}{2}N_1(\Delta^{2n+2} V_{n+1} + \Delta^{2n+2} V_n)$$
$$+ \frac{1}{2}N_2(\Delta^{2n+4} V_{n+2} + \Delta^{2n+4} V_{n+1}) + \ldots\ldots\ldots$$

and similarly when m is odd,

$$\left\{ \log (1+\Delta) \right\}^{2n+1} u = \frac{1}{2}(\Delta^{2n+1} U_{n+1} + \Delta^{2n+1} U_n) + \frac{1}{2}N_1(\Delta^{2n+3} U_{n+2} + \Delta^{2n+3} U_{n+1})$$
$$+ \frac{1}{2}N_2(\Delta^{2n+5} U_{n+3} + \Delta^{2n+5} U_{n+2}) + \ldots\ldots\ldots$$

The values of the coefficients N are as follows:

$$N_1 = -\frac{1}{24}(m+3),\ N_2 = \frac{1}{2^7.3^2.5}(5m^2+52m+135)$$

$$N_3 = -\frac{1}{2^{10}.3^4.5.7}(35m^3+777m^2+5749m+14175)$$

$$N_4 = \frac{1}{2^{15}.3^5.5^2.7}(175m^4+5720m^3+96794m^2+619776m+1488375)$$

Remember that the sum of two successive differences is the difference of alternate numbers in the preceding column.

I subjoin the formulæ most frequently occurring in practice; for integrals

$$\frac{1}{h}\Delta\int u\,dx=\tfrac{1}{2}(u+u_1)-\frac{1}{24}(\Delta^2U_1+\Delta^2u)+\frac{11}{720}\Delta^4U_2+\Delta^4U_1)$$

$$-\frac{191}{210.2^6}(\Delta^6U_3+\Delta^6U_2)+\ldots\ldots\ldots\ldots$$

$$\frac{1}{h}\Delta\int u\,dx=V+\frac{1}{24}\Delta^2V_1-\frac{17}{5760}\Delta^4V_2+\frac{367}{1890.2^9}\Delta^6V_3-\frac{27859}{56700.2^{13}}\Delta^8V_4$$

$$+\frac{1295803}{1871100.2^{16}}\Delta^{10}V_5-\frac{15183675231}{7662154500.2^{20}}\Delta^{12}V_6+\ldots\ldots$$

$$\frac{1}{h^2}\Delta^2\iint u\,dx^2=u_1+\frac{1}{12}\Delta^2u-\frac{1}{240}\Delta^4U_1+\frac{31}{1890.2^5}\Delta^6U_2-\frac{289}{56700.2^6}\Delta^8U_3+\ldots\ldots$$

Most of Legendre's tables of definite integrals were computed by the second or third of these formulæ. His great table of elliptic functions was calculated by the second. I am not aware that the first has been given until now.

For differential coefficients, we have

$$h\frac{du}{dx}=\tfrac{1}{2}(\Delta U_1+\Delta u)-\frac{1}{12}(\Delta^3U_2+\Delta^3U_1)+\frac{1}{60}(\Delta^5U_3+\Delta^3U_1)$$

$$-\frac{1}{280}(\Delta^7U_4+\Delta^7U_3)+\ldots\ldots\ldots\ldots$$

$$=\Delta V_1+\frac{1}{3.2^3}\Delta^3V_2+\frac{3}{5.2^7}\Delta^5V_3-\frac{4}{7,2^{10}}\Delta^7V_4+\frac{35}{9.2^{15}}\Delta^9V_5-\ldots\ldots$$

If we make $m=0$ in the N-formula, we obtain

$$u=\tfrac{1}{2}(V+v_1)-\frac{1}{2^4}(\Delta^2V_1+\Delta^2V)+\frac{3}{2^8}(\Delta^4V_2+\Delta^4V_1)$$

$$-\frac{5}{2^{11}}(\Delta^6V_3+\Delta^6V_2)+\frac{35}{2^{16}}(\Delta^8V_4+\Delta^8V_3)-\ldots\ldots$$

a well known formula of bisection.

13, *Brompton-row, April*, 1856.

SIR JAMES SOUTH AND THE ROYAL AND ROYAL ASTRONOMICAL SOCIETIES.

(*Continued from page* 437.)

Sir James next goes on to say, "The best answer I can afford to the misrepresentations of 'the Council of the Royal Astronomical Society,' implying that the integrity of the late Reverend Richard Sheepshanks has only recently been impeached by me and for the first time, is the following copy of a letter which I received from the Rev. Dr. Robinson, Director of the Armagh Observatory:

'OBSERVATORY, ARMAGH,
'*June*, 15, 1853.

'Dear Sir James,—On my arrival here last night, I found yours, in which you tell me that Mr. Sheepshanks, while admitting that he caused the name of Troughton to be engraved on a circle of Jecker's for the purpose of evading the Revenue laws, denies the other facts stated by you in the *Mechanics' Magazine* (July,* 1852), and asserts that you invented them *after Troughton's death*.

'As to his denial of the facts, it may pass for its worth; but that you stated them long before Troughton's death all your friends can testify; of one instance I can give the date very nearly,—beginning of July, 1833. When coming to London from the meeting of the British Association at Cambridge, I found you and Troughton at issue about the luckless equatorial. I saw with great pain two so long devoted friends, and whom I so greatly respected, on the verge of deadly feud, and endeavoured to prevent it. You will remember that you consented to leave the dispute to the arbitration of me or any one I would name, but Troughton would hear of no terms whatever. Yet when I reminded him of "old times," his heart did soften a little; but he said he could not act *without the consent of Mr. Sheepshanks:* and so the matter ended. *That day* I met you at dinner at Mr. F. Baily's, and told you how much I was disappointed. You certainly did not spare Mr. S. on the occasion. When I expressed my regret that a *Clergyman* should so far forget his duty as a *peacemaker*, you told an anecdote of him while in your house at Passy, which showed that such obligations did not press heavily on him; and when some of the company were surprised at his opinions, you told, *in all its parts*, the history given in the *Mechanics' Magazine*.

'*Then* it was quite familiar to me, and seemed so to Mr. Baily, so that I must have heard it in 1830 at latest. But this surely is needless: whatever faults you have, none who knows anything

* "It is printed '*July*' in the *Mechanics' Magazine*, but it ought to have been printed '*January*.'"

of you can possibly think want of truth is one of them; most certainly not,

'Yours ever,

'T. R. ROBINSON.'

'Sir James South.'

"The late Council of the Royal Astronomical Society state, that the 'imputation' would not have been mentioned in 'the Report' 'except simply to record that sense of the utter needlessness of any reply to such an accusation, which the Council showed when they neglected the formal application made to them on the charge.'

"It may, perhaps, be inferred that I made a 'formal application' to the Council of the Royal Astronomical Society upon the subject; but the fact is, that I never made, either directly or indirectly, any 'application' to any Council of the Royal Astronomical Society, or to any other society, in respect of my controversies with the late Reverend Richard Sheepshanks."

Having thus amply vindicated himself on the main question, Sir James approaches the more abusive and scurrilous portions of Mr. Sheepshanks' pamphlet:

"From the *sneaking* notice by the late Council of the Royal Society, and from the *impudent* notice of the late Council of the Royal Astronomical Society, a degree of notoriety has been given," says Sir James, "to the 'Defensive Pamphlet' which it could not otherwise have acquired. I am, therefore, compelled to notice a charge of fraud which the late Reverend Richard Sheepshanks has made against me, viz., that my dispute with the late Mr. Troughton was only to evade my pecuniary liabilities to that gentleman.

"Perhaps the accompanying letters from Sir David Brewster and Mr. Gwilt will slightly illustrate the degree of reliance which ought to be placed upon the assertions of the late Reverend Richard Sheepshanks:

'ALLERLY, BY MELROSE.
'*Feb.* 23, 1833.

'My dear Sir James,—During the week which I spent under your roof, and especially during the many observations which I made with the large equatorial in company with yourself and others, I saw the great distress and vexation in which you were involved, by the instability of the instrument. I had heard also from others, that Mr. Troughton had suffered equal vexation from the same cause; and I therefore felt an unusual degree of interest in the measures which were proposed to remove the recoil of the telescope.

'On the day when Mr. Simms came to the observatory to apply the friction rollers, I recollect well your having requested me to impress upon him the necessity of making every exertion to render the instrument fit for observation, and to hint to him how injurious a failure in this respect would be to his professional reputation. You had more than once stated to me your conviction, that no good would be derived from the application of the friction rollers, and I was therefore anxious to be present at the trial of them.

'With this view, I spent a long time in the observatory with Mr. Simms; having quitted it, I returned frequently during the day. I found Mr. Simms perfectly sensible that the instrument was a failure, and exceedingly anxious, both on your account and for the sake of his professional name, to give it the stability which is required. He anticipated great advantages from the rollers; but after the numerous experiments which were made in my presence, and in which I assisted, I was perfectly convinced, and he seemed to be so also, that the cause of the recoil could not be removed by such means. We discussed the hypothesis of a momentary twist in the frame arising from the elasticity of the materials; and with the view of throwing some light on the subject, he applied a telescope with a micrometer, which he had brought with him for the purpose. The observations, however, did not indicate any perceptible change of form.

'If I recollect rightly, you were in London when these experiments were going on: and upon your return I mentioned to you all that had been done in the observatory. On this and on other occasions, I remember your stating to me that you had offered to pay Mr. Troughton all that he had expended, provided, that he would adopt the plan of the five feet equatorial, which you had from the first thought the best, but which, in deference to Mr. Troughton's opinion, had been abandoned.

'At dinner, the whole subject was discussed between yourself, Mr. Simms, and me; and I recollect that you expressed yourself in the strongest manner, both in reference to the total obstruction of your own observations, and to the influence which a failure in rectifying the instrument would have on his professional character.

'Such is the substance of what I distinctly recollect; much more was said on the subject, and if I were near you, I dare say you might recall a great deal of it to my remembrance.

'I am,

'Ever most faithfully yours,

'To Sir James South.' 'D. BREWSTER.'

'20, Abingdon-street,
'*Jan.* 16*th*, 1833.

'Dear Sir James,—In answer to your favour of yesterday, I have to observe to you, that previous to your journey to Russia, in my conversations with Mr. Simms, relative to the equatorial, he has more than once expressed to me his regret at its unfortunate failure, and his surprise at your great patience and forbearance with his firm; and most particularly did he so on one occasion when walking home from your house, and with an expression to me of the unpleasant feeling he had as to the amount of the cost compared with the inefficiency of the work done. My recollection of this last-named conversation is, from accidental circumstances, particularly strong.

'Believe me, dear Sir James,

'Yours very faithfully,

'To Sir James South.' 'JOS. GWILT.'

"On the 18th of October, 1833, Messrs. Troughton and Simms, in a letter to Messrs. Few and Co., offered to leave the matters in difference to—using their own language—

'Indifferent and unquestionable judges, for instance, the Astronomer Royal, Sir John Herschel, Mr. Baily, Captain Kater, Captain Beaufort, Captain Smyth, &c.; or by a certain number of referees appointed on each side.'

"On the 30th of October, 1833, Messrs. Few and Co., in a letter to Messrs. Troughton and Simms stated:

'Sir James South would not object to a reference of the entire case to the gentlemen named in your letter of the 18th inst.; but as from the cir-

cumstance of Sir John Herschel being under early engagements to quit the country, we apprehend it would be impossible for him to give his attention to it. Sir James would propose the substitution of the name of Dr. Robinson, of Armagh, for that of Sir John Herschel: we write on the assumption that he, and all the others, will consent to become referees.'

"The offer made on the 18th of October by Messrs. Troughton and Simms was, however, after its substantial acceptance by Messrs. Few and Co. on the 30th of October, withdrawn, by a letter from Messrs. Chisholme and Co. to Messrs. Few and Co., of which the following is a copy:

'64, Lincoln's-inn-fields.
'*Dec. 3rd*, 1833.

'Dear Sirs,—We beg to propose on behalf of Messrs. Troughton and Simms, to refer all matters in difference between them and Sir James South to the determination of a Sergeant or Barrister-at-Law, to be mutually agreed on, Messrs. Troughton and Simms having liberty of access to the equatorial with their workmen and scientific friends, at such times and under such conditions and restrictions as the arbitrator shall direct, for the purpose of putting the instrument into working order, and of adjusting the same with the use of Sir James's large object glass. Should your client agree to this, we will prepare and send you the draft agreement for your perusal.

'We are, dear Sirs,
'Yours obediently,
'CHISHOLME, HALL, & GIBSON.'

"To this letter Messrs. Few and Co. returned the following answer to Messrs. Chisholme and Co.:

'Covent Garden,
'*Dec. 7th*, 1833.

'Dear Sirs,—We take shame to ourselves for not earlier replying to your favour of the 3rd, by stating that we cannot advise Sir James South to refer such a subject to any gentleman of the bar, satisfied that scientific persons can alone be competent to do justice to either party, and such certainly at one time appeared to be the opinion of your clients.

'We have only to repeat our readiness to refer all questions, as stated in our letter of the 30th October to Messrs. Troughton and Simms.

'We are, dear Sirs,
'Yours, &c.,
'FEW, HAMILTON, & FEW.'

"On the 12th of December, 1833, Messrs. Chisholme and Co. sent a letter, of which the following is a copy, to Messrs. Few and Co.:

'64, Lincoln's-inn-fields.

'Dear Sirs,—Messrs. Troughton and Simms and Sir James South. As you altogether decline a reference to a barrister, and as we cannot advise our clients to accede to the reference proposed by you, we are driven to the other alternative, of commencing an action.

'We enclose process for your undertaking, which we presume you will give.

'We remain, dear Sirs,
'Yours faithfully,
'CHISHOLME, HALL, & GIBSON.'

"It is upon these facts that I have been accused by the late Reverend Richard Sheepshanks, in his 'Defensive Pamphlet,' of being a 'shabby, shuffling debtor.'

"The Reverend Richard Sheepshanks has also stated in his 'Defensive Pamphlet,' that 'the only remark which he [Troughton] made during the contest was, that I had not acted with sufficient vigour towards Sir James. 'You should have arrested him,' he said; 'the fellow has a white feather. Frazi arrested him, and got paid.'

"Frazi never arrested me;* and the following copy of a letter which I received from Mr. Seaward,† who was conversant with all the facts of the case, will establish the malice and falsehood of the language in the foregoing extract:

'Canal Iron Works,
'*March 14th*, 1837.

'Dear Sir,—I am truly surprised at the contents of your letter of this date, that circumstances should have occurred to render it necessary for you to inquire of me whether your conduct towards Mr. Frazi on the subject of the large dome of your observatory was incompatible with the feelings of an honourable man, or inconsistent with the sentiments of a gentleman: such I understand having been insinuated against you by Messrs. Sheepshanks and Simms, through their counsel, Mr. Starkie.

'I remember perfectly well having been introduced to you by Mr. Simms, for the purpose of offering you my advice and assistance, among other things, respecting the claim of Mr. Frazi for work done to the large dome, and in which claim I must say you had great reason to be dissatisfied.

'You adopted my recommendation in the settlement of that claim, and it is with the greatest pleasure that I can bear testimony to your gentlemanly and honourable conduct throughout that transaction; and I will most cheerfully attend to state the same on oath, if you shall find it necessary for me to do so.

'I am, dear Sir,
'Your most obedient Servant,
'JOHN SEAWARD.'

'To Sir James South, F.R.S., &c. &c.'

(*To be continued.*)

THE CALORIC ENGINE:

CAPTAIN ERICSSON'S RECENT PATENT.

BY AN AMERICAN ENGINEER.‡

THIS last modification of the caloric engine presents very remarkable features. In common with the engines of the caloric

* "I may here observe, that during the continuance of my disputes with the late Mr. Troughton, I implicitly followed the advice of my friends —Admiral Sir Francis Beaufort, Mr. Joseph Gwilt, the Rev. Dr. Robinson, Mr. Babbage, the late Dr. J. Scott, and the late Mr. Francis Baily. And in my controversies with Mr. Frazi, I acted under the advice of Mr. Seaward, Mr. Simms, Sir Francis Beaufort, Mr. Joseph Gwilt, Mr. Babbage, the late Dr. J. Scott, the late Mr. Francis Baily, and the late Mr. Troughton."

† "Until Mr. Simms introduced me to this distinguished engineer, I had not the honour even of his personal acquaintance. He represented him to me as a man of the highest integrity and of the soundest judgment—and that to him I might confide the examination of Frazi's 'scandalous bill' beyond any civil engineer with whom he was acquainted."

‡ The following paper was written in consequence of the appearance of an article in the *Illustrated London News* of the 23rd February, by Mr. Bourne, which has given great offence to the

ship, which excited such lively interest in the commercial world, this engine retains the heat of the air passing off from the working cylinder to the cold air entering the heaters. This transfer of the caloric from the air that has performed its duty, to the air which enters the machine, Captain Ericsson accomplishes, in this instance, by the same means adopted in his original engines, in 1833, the escaping hot current sweeping the exterior of a series of tubes whilst the cold current traverses their inside on its way to the heaters. By this method the engine is rendered chiefly dependent on the heat which in the steam engine is wasted.

The apparatus which effects this great object has been termed by the inventor a regenerator, and the entire machine a caloric engine—very appropriate terms certainly, for although the steam engine is also a caloric engine, the application of the heat in it is not direct. The new motor, on the contrary, applies the heat directly to the acting medium, besides returning it, and is therefore emphatically a caloric engine.

The utility of the regenerator has been questioned by many, but approved by high authorities, such as Regnault. Others, again, have contended that the inventor claims for it properties akin to the chimera of perpetual motion—a most inconsistent assertion, as the fall of temperature by expansion proved to be very considerable in the trial engine of 1833, the question of returning the heat by the regenerator being then fully discussed, by Ure, Faraday, and Lardner, who all examined the engine and admitted what the inventor claimed for the regenerator. Professor Faraday, at that time, lectured before the Royal Institution on a model regenerator, furnished by Captain Ericsson. Faraday is not a man to propagate ideas involving perpetual motion.

The annexed diagram, representing the modified caloric engine recently patented by Captain Ericsson, exhibits the principle and mode of operation at one view. The mechanism for moving the pistons has been omitted in order not to divert the mind from the essential features of the combination.

Fig. 1. Fig. 2.

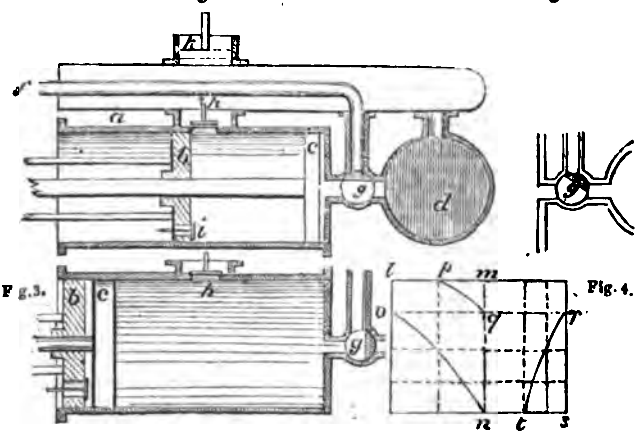


Fig. 3. Fig. 4.

"*a* represents the cylinder open at one end; *b* and *c* the working and supply pistons, the latter performing twice the motion of the former; *d*, heater, acted upon by a furnace; *e*, vessel connecting the cylinder with the heater; *f*, pipe for carrying off the heated air from the cylinder. The operations of the engine will be readily understood. Charge *e* and *d* with air of 15 lbs. pressure to the square inch, and load the regulator, *k*, according to that pressure; set the valve, *g*, as shown in fig. 1, and then move both pistons from the position assumed in that figure, to that exhibited in fig. 2. The result of this movement will be the expulsion of the air between *c* and the bottom of the cylinder, and the charging the space between the two pistons with fresh air entering through the valve, *i*. The valve, *g*, being thus set, as shown in fig. 2, the heated compressed air

friends of Captain Ericsson. The writer is an eminent engine manufacturer, and proprietor of certain works in New York. He has known Captain Ericsson for sixteen years, and constructed several of his engines; his remarks will therefore be read with interest. For this reason we give place to them, without professing to give our sanction to all they convey.—Ed. M. M.

from *d*, will force the piston, *c*, towards *b*, until an equilibrium of pressure is established. The movement of *c* being then continued by auxiliary means until it reaches *b*, the cold compressed air will pass from the cylinder through the valve, *h*, into the vessel, *s*, whilst the space vacated by *c* will be filled with hot air of equal tension. The valve, *g*, being then closed, as in fig. 3, and the working piston, *b*, liberated, both pistons will move together by the expansive force of the confined hot air towards the open end of the cylinder. It will be readily conceded that no other force can be expended in this operation than that incidental to friction, since each piston either moves in equilibrium *or exerts useful force*. The remarkable object then obtained by Captain Ericsson's new invention is the compression of the cold air, and the charging the heated against a pressure of 15 lbs., without expending any force apart from overcoming friction. The inventor, however, accomplishes still more; he sustains a working pressure of 30 lbs. in the engines he has built, by making the supply piston perform the full inward stroke during the period occupied by the working piston in making half stroke, thereby causing a greater amount of air to be drawn in between the two pistons, and at the same time a compression is in the cylinder of 7½ lbs. This compression, of course equal to an absolute tension of 22½ lbs., will, under an elevation of temperature of 500°, maintain in the heater a working pressure of 30 lbs. above the atmospheric resistance. The force exerted by the working pistons under this arrangement, it will be seen, continues during the entire stroke, commencing with 30 lbs., and ending with an effective pressure fully as great as in expansive steam engines. The resistance encountered on the return of the working piston is confined to half of its stroke, the counterforce being at the end only half atmospheric pressure, and the mean resistance for the entire return stroke less than 2 lbs. to the square inch. The force exerted by the supply piston during its return movement, acts during a space nearly equal to half the stroke of the working piston, commencing at 22 lbs., and diminishing according to the law of expansion. An analysis of these forces will be found in fig. 4, in which the areas *l*, *m*, *n*, *o*, and *r*, *s*, *t*, represent the power produced, and the area, *p*, *m*, *q*, the expenditure.

The magnitudes of the areas thus presented to the eye, express exactly the relative amount of power expanded and of power produced, the former being but a fraction of the latter.

The advantage resulting from the mere proportion thus exhibited of force imparted to the machine, and force expended in compressing the cold air, is by no means apparent to those who merely theorize in the matter. Indeed, Captain Ericsson's disappointed expectation, in relation to the caloric ship, is solely to be attributed to his disregarding the size of the supply cylinders, on the strength of his theoretical deduction that, however great the force expended in compressing the air, it would be returned by the working cylinders independently of heat. The differential force of the gigantic pistons, considered by itself, certainly appeared most satisfactory, but proved too precarious in practice. The resisting force within the machine was too great in proportion to its entire motive energy—there was not margin enough to meet the unavoidable losses in practice. Already six engines have been built under the recent patent, with cylinders varying from 15 to 40 inches diameter, all of which are now under trial. One of these, an engine with cylinders of 30 inches diameter, finely executed, and working with peculiar regularity and smoothness, is intended for Europe.

Altogether, Captain Ericsson has built twenty-seven engines, in New Town, actuated by heated air, *twenty-five* of which the writer has seen in operation. The vast labour expended in planning, independently of execution, can only be appreciated by those who are acquainted with the wide range of Captain Ericsson's experiments, and the diversity of form and combination of these engines, destined shortly to supersede steam as a mechanical motor.

FAIRBAIRN AND HASLEM'S IMPROVEMENTS IN RAILWAY WHEELS AND LOCOMOTIVE ENGINES.*

Messrs. W. A. Fairbairn and G. Haslem, of Manchester, have recently patented an invention which, in the first place, has for its object the production of certain arrangements which will allow the wheels of railway carriages to accommodate themselves to the curved portions of the way, and thus diminish the wear of their flanges, and to provide also against wear on the sides of the axle-boxes. The arrangements consist in giving liberty to the axle-boxes laterally, within certain limits and at certain times, determined by a spring action formed on each side of the axle-boxes, or within the jaws holding the axle-boxes, and acting on each side of them. The spring action may be formed of vulcanized India-rubber placed

* Patent dated 11th October, 1855.

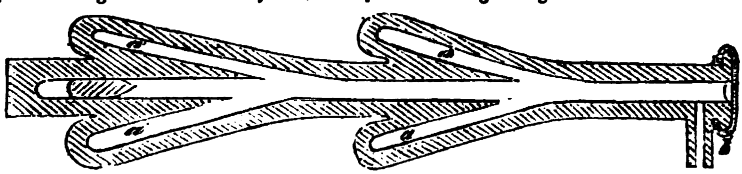
in recesses in the jaws holding the axle-boxes, which India-rubber will exert its elastic force upon the sides of the axle-boxes by acting against plates loosely fitted in the recesses in the jaws, and coming against the sides of the axle-boxes. The force of the spring action is intended to be sufficient to keep the axles of the wheels at right angles to the straight portions of the railway, but to give way to the pressure created by friction of the rails upon the wheels in curved portions of the way, and by this means allow the axles to assume that position which will accommodate the wheels to the curve of the way. As the spring action will keep the axle-boxes in close contact with the jaws so as to be at all times a good fit, they will not require "lining" in consequence of wear, as those do of ordinary arrangement.

The improvements relate, secondly, to arrangements in the connecting rods of locomotive engines, and principally to those rods connecting the crank wheels to be coupled together, and they are intended to act as a provision against undue strains to which such rods are subjected. These arrangements consist in giving liberty to the steps or brasses within certain limits, determined by a spring action arranged in the slots of the connecting rods, of like character, and acting on the steps or brasses (which may be considered to represent the axle-box) in a manner similar to that described above, in reference to the axle-box arrangement.

AMERICAN IMPROVEMENTS IN CANNON.

An American gentleman has recently obtained a patent in this and other countries for an invention designed to increase both the weight and the force of the projectile, without materially increasing either the weight of the gun or its liability to burst. Two arrangements are employed in order to accomplish this.

The first consists in placing upon the sides of the gun additional charge chambers, which are termed "accelerators," and which being charged with some detonating



materials explode, as soon as the shot or projectile passes their openings, thereby successively accelerating its rate of speed. The gun is of any ordinary kind as respects the form of the bore, being either rifled or plain, breech-loading or otherwise. The annexed engraving is a sectional elevation of a fire-arm constructed according to the invention. The accelerators shown at *a*, are chambers, inclined to the main bore, and pointing towards the muzzle. In loading, a charge of ordinary powder is put in, as usual, and then the shot. The accelerators are then charged with powder, or gun-cotton, or both, as may be. The muzzle is to be covered with some flexible material, as sheet caoutchouc, clamped tightly upon it, and then the air is to be exhausted, through an opening, *b*, placed near the muzzle, the vent, of course being closed. On firing the powder which is behind the ball, the latter is started forward and as it passes beyond the mouths of the accelerators, the fire communicating with them, they are also discharged, and of course increase the force which impels the shot. As no air is in the bore in front of the shot, that cause of resistance is not present to retard it. The obstruction to the projectile passing through the patch of flexible material is so slight as hardly to need to be taken into account.*

FOREIGN INTELLIGENCE.

Scientific, Engineering, Architectural, &c.

Novel System of Iron Furnaces.—The most ingenious method of M. Chenot is about to be introduced by some French capitalists in the works of the *bassin* of Charleroi. The theory of this procedure consists in a *separation* of the iron (spar-iron, manganese-iron, and other ores) from the surrounding matrix by the usual crushing machines, which are then melted with an addition of coal in furnaces not higher

* Patent dated Nov. 5, 1855.

than two or three metres, and having only low chimneys instead of the high hitherto used. The crushed ores are first spread over an endless piece of cloth, above which rotate three or four rows of circular electro-magnets. The magnets lift up the particles of iron, and move them by the rotation of the circles several feet above the cloth; there they lose their magnetic power by the interruption of the current and the particles of iron fall to the bottom. The other portion of the cloth carries off the non-magnetic component parts of the ore. The ores (oxydes of iron) are now melted by a stream of carbonic oxygen gas, or in a blast furnace (*flammofen*), and the pig iron thus obtained can be converted by simple pressure and subsequent heating, into cast iron; or the compressed lumps can be converted into steel in the usual way. M. Chenot's works have been hitherto at Clichy, near Paris, and, according to his calculation, he will produce 1000 kilog. of pig iron with 700 kilog. of charcoal. If this new procedure should turn out satisfactory, cast iron can be produced without expensive furnaces, and no puddling will be required for obtaining wrought iron.

Exsiccation of the Marshes of Ostia.—Pio IX. proposes to dry up the extensive marshes of Ostia, by which much useful land would be gained for agriculture, &c. So early as the eighth century, St. Zacharias employed colonists to cultivate the *Agro Romano*, and Pio VI. dried up the Pontine marshes. The neighbourhood of the fine castle of Ostia, now completely desolate, and covered by bulrushes and useless small timber, would thus be made habitable.

Original Inscription.—The house which has been built for the late *F. L. Jahn*, the German gymnast, by national subscription, exhibits this most original inscription: "*Frisch, frei, fromm, froh.*"—Fresh, free, pious, contented!!

[*Communicated by* Dr. J. Lotsky.]

THE SMOKE ACT AND THE POTTERIES.

We have recently had submitted to us, by Mr. Woodcock, the patentee of the furnace bearing that name, a model of a pottery kiln in which arrangements are made for avoiding altogether, or in a great measure, the production of smoke, the object being to provide means for meeting the requirements of the Smoke Act in the extended form proposed to be given to it by Lord Redesdale. The improvements consist in supplying certain perforated plates or wire gauze, or other similar material, through which air is admitted to the kiln fires. We may give an engraving of the arrangement in an early Number. The model will be exhibited at the Soirée of the President of the Institution of Civil Engineers, on Tuesday evening next.

THE LATE Mr. ELIJAH GALLOWAY, C.E.

The late Mr. Elijah Galloway, who was well-known among civil engineers, died on the 4th of March last, from a surgical operation, leaving a widow and daughter, the latter of whom is in an extremely delicate state of health; both are utterly penniless, and a few friends of the deceased are seeking to raise a small fund for their benefit. The fund so raised is to be applied at the discretion of Mr. Francis Pettit Smith, of Dartmouth-terrace, Blackheath, and Mr. Robert Few, of 2, Henrietta-street, Covent-garden, who have kindly consented to accept subscriptions payable to themselves, or to their account at Messrs. Currie and Co., Bankers, 29, Cornhill. We commend the case to the attention of our readers, many of whom are acquainted with the inventions, &c., of the deceased.

COALS, CINDERS, AND CULM.

Last year, as appears from a return just printed, 8,853,142 tons of coals, cinders and culm were shipped coastwise to other ports in the kingdom, and 37,902 tons of patent fuel. The total quantity of coal, cinders, and culm, exported in 1855, was 4,976,902 tons; and of patent fuel, 84,860 tons; the value of each having been respectively 2,446,341*l.*, and 58,985*l.* 3,016,868 tons of coals were brought into London in 1855, coastways, and 1,162,487 tons by inland navigation and land carriage.

Analysis of Ornament. The Characteristics of Style: An Introduction to the Study of the History of Ornamental Art; being an Outline of a Course of Sixteen Lectures on that Subject. Originally prepared for the Government Schools of Design in the years 1848-9-50. By Ralph N. Wornum. London: Chapman and Hall, 193, Piccadilly. 1856.

This work constitutes, not a Report, but an abstract of the substance of Mr. Wornum's Lectures, and is designed as an aid to the student, to enable him to make profitable use of the works in the Government Library (of which the author is Librarian), in furtherance of a general study of Ornamental Art. It is illustrated by a number of excellent illustrative cuts engraved by the

female students of the wood engraving class at Marlborough House.

It must not, however, be understood from what we have said, that the work is a mere catalogue of existing books; on the contrary, it contains a good outline of the principal styles of ornamental art, and of the varieties into which these have from time to time been developed, thus presenting both a summary fitted to impart to the general reader a knowledge of the leading features of the study, and a guide by which the student of the art may be conducted to the recognised sources of instruction. As might be expected, the author's object is not to criticise or improve ornamental art, but to expound its principles. "We have not now to *create* Ornamental Art, but to *learn* it; it was established in all essentials long ago;" this is the view with which he has written his treatise, and is, when not distorted, a true one. We are glad to observe, however, that he does not omit to point out forcibly the vicious tendency sometimes exhibited in our modern ornamentation. He stigmatizes, for example, a gas jet in which the flame proceeds from the heart of a flower; a cup for holding liquid formed of a lined basket mounted upon the head of an ox; and a bell made of leaves! He might also have referred, had his object been to extend his criticisms in this direction, to such cases as those very common ones in which tea is vomited from the mouth of a bird, &c. We even remember having seen, in a government establishment, a pump from which the clear fresh water was delivered through the swollen nostrils of a leaden-headed savage. We commend the work both to the Art-student, and to the general reader whose tastes lead him to an acquaintance with the principles of an art which daily multiplies its good and bad productions before the eyes of all.

WOODCOCK AND GARDNER'S PATENT FURNACES.*

To the Editor of the Mechanics' Magazine.

SIR,—In your number of this day Mr. Woodcock has referred to mine of the 19th ult., and continues to insist on the necessity of bringing the *gases* (which he too often confounds with *smoke*) evolved from the coal in a furnace, into contact with other heated matter. He may be assured such contact is unnecessary. His meaning is so distinctly enumerated in the following passage that it cannot be mistaken. He says: "The peculiar position of the inverted bridge compels the flame and gases to *impinge upon the incandescent coke* or carbon lying upon the extremity of the fire bars; whilst the gases, as they leave the fuel in distillation, are entirely surrounded by *small jets of atmospheric air*." Here the two principles are clearly stated. Now the *latter* cannot be the subject of a patent—that being the very substance of the expired patent of 1839; and the mere recital of it, except for the purpose of *disclaimer*, is enough to vitiate any patent; yet the whole depends on these very perforated distributors. The *former* principle—the causing the gases and flame to *impinge on the incandescent fuel*—is altogether erroneous, chemically and practically. It is even strange how this idea (taken from Watt's patent of 1785) should continue to be entertained, contrary to all chemical knowledge, and without proof of its value or truth.

For what purpose, it may be asked, is the flame and gas made to impinge on the incandescent coke? The carbon of the flame (the only combustible it contains) requires no contact or impinging on heated matter, being already at the temperature of 3,000°. For what purpose, then, except to *cool it down*, is it to be forced against a body of fuel which must be much lower in temperature? Thus of the two principles or objects dwelt on by Mr. Woodcock, the one, the introducing the air by numerous small jets cannot now be claimed by any patentee; the other, the impinging on heated fuel, is not worth a thought.

Mr. Woodcock "contends for *cold* air to the *fuel*, but *hot* air to the gases." Why this distinction? The conditions of combustion are the same in both. The body to be consumed is either the hydrogen or the carbon of the gas. Now, once ignited, the process of combustion in both is *continuous*, so long as the contact with air is continuous, as we see in ordinary gas burners. Combustion is carried on not by heat derived from any extraneous source, but by virtue of the *self-generated* temperature of the combustible from atom to atom, and wholly irrespective of heat from other sources. With his intelligence, Mr. Woodcock cannot fail to see the double error into which he has fallen.

"It is impossible," he reports, "to get rid of all smoke in an ordinary furnace, without causing the gases to impinge upon the incandescent fuel before they receive their full supply of oxygen." I need only say, the experience of the last dozen years, and of every day, most distinctly proves the contrary. How, it may be asked, does the gas in the Argand lamp continue burning without smoke, and where there is no incandescent fuel? The mere observation of the

* Future letters on this subject must be brief, or they will not be inserted.—ED. M. M.

combustion of gas (commonly called smoke), rising from the coal in a house grate should have corrected so erroneous an idea. We there see the gas rising out of the black mass of coal, converted into clear flame, with perfect combustion. It may then, with equal truth be asserted, that this gas and flame, which we see *above* the coal, should be returned, and made to impinge on the incandescent fuel within the bars.

In my last, I said, Mr. Woodcock describes his own patent as, a "hanging bridge so arranged as to cause the products of *combustion*," &c., and which I observed should, with more correctness, have been "the products of *non*-combustion." He now asks, "Why I thus corrected his words?" Manifestly, because the products of combustion must be *incombustible*, and cannot require the use of the jets of air; whereas, the *non*-consumed parts are those which do require the air to effect their own combustion. Again, he asks, "What are the products of *non*-combustion?" In the case under consideration they are—the unconsumed, cooled down, atoms of carbon of the gas.

Again, Mr. Woodcock asks, "How does Mr. Williams prove that the gases, after having left the source of their generation, and having been in contact with the boiler, are at the heat of incandescence, and if they are so, how is it that the carbon is developed in the furnace in the shape of smoke?" I fear Mr. Woodcock has misapprehended what was said. The carbon of the gas, I stated, *while in the state of flame*, is at the high temperature of incandescence, or 3000°. Contact with the boiler would, more likely, *reduce* its temperature to that of sooty matter.

But carbon is not developed *in the furnace* in the shape of smoke. It is *after* it has passed the furnace, and has been cooled down, without combustion, that it assumes that form. Mr. Woodcock concludes with stating, that "He gives the requisite supply of air *after*—not *before* contact with the incandescent fuel." Now, this is the gravest error of all. The air should be brought into contact with the flame at the earliest possible moment, as seen in gas burners, seeing that the high temperature of its carbon is the very element of rapid union and combustion.

I am, Sir, yours, &c.,

C. W. WILLIAMS.

Liverpool, May 10, 1856.

To the Editor of the Mechanics' Magazine.

SIR,—It is truth alone that is to be feared when arrayed against us; for falsehood brings its own reward. I will proceed to show that Mr. Woodcock's statements, contained in your journal of last week, are the contrary of facts; which latter must be purposely perverted, or Mr. Woodcock's statements issued without correct information and inquiry; which latter position, if it be so, is more unworthy than the former. I have shown that Mr. Woodcock's patent consists of three or four several parts, with regard to each and every one of which he can make no claim, and that he himself confesses with regard to each part—"*it is not new.*" Mr. Woodcock's apparatus will be found to supply air, not afterwards only, as he represents both patents to do, "*and as mine only does,*" but particularly he claims the combined use of a perforated fire-door to admit air to the *front* of the furnace; also *air flues placed in the interior of the furnace, that they may become highly heated.* The injurious practice of *highly* heating air, or bringing air in contact with *highly* heated substances before entering the furnace, need not be commented on. Then comes the after supply, by means of a hollow bridge. That air admitted in the front of a furnace only produces evil results is so generally understood, that I provide with the greatest care *to prevent ingress of air, and consequent cooling down of the interior of the furnace.* Mr. Woodcock distinguishes that my deflecting plate and diaphragms are set at an angle (the principle and effect of such an arrangement is now well understood); he then proceeds lamely to borrow this, if he possibly may, and says, "occasionally so do I." A reference to Mr. Woodcock's specification, or the cut of his apparatus, proves the absurdity of his statement. A deflecting plate is visible in mine, not a hanging bridge. In conjunction with and facing the deflector will be noticed a striking plate, of essential fitness in practice. That the diaphragms are not bridges is certain; for I preserve the ordinary bridge unaltered; *in front of this are placed the diaphragms, set at an angle in keeping with the deflector.* A bridge is to spread the flame and heated products, and bring them in contact with the surface of the boiler. The *diaphragms* certainly do not fulfil such an office. I do not claim the right of placing the deflector and diaphragms perpendicularly, as my specification shows. The cut given of Mr. Woodcock's apparatus represents the flame-bed on a level with the fire-bars, thus giving double the usual space for the reception of the "non-conducting" gaseous products, which possess great capacity for heat; an injudicious arrangement, not to be found in any principle of construction. According to Mr. Woodcock's prolific ideas, I lay claim to all patents that ever have or ever shall exist for the like pur-

pose as my own, and he confesses he quarrels not with my apparatus, but with the greediness of my claim; but how cunningly does he cut and mangle, twist and contrive, to give his purpose and strength! At least, he should deal honestly with my own written words, and not give those only which apparently meet his views. "*To all intents and purposes*" are words I use, but only conjointly with others, which others Mr. Woodcock burks, and would doubtless bury in oblivion.

Have I not more than once through this medium renounced Mr. Woodcock and his plan? Why should he continually make me present myself as claiming his combination of things, not novel nor his own? Mr. Woodcock's experience of my apparatus is the most curtailed and illucid that could possibly exist; the statements which he offers as his experience I can positively deny. No person has complained of the success or incompleteness of my apparatus, nor has the apparatus ever given other than the greatest satisfaction. Mr. Woodcock should publish names, that we may deal with his statements as they deserve. "The other," to which Mr. Woodcock alludes is explained as follows: At the London Zinc Mills was a tubulated boiler, with internal fire-box, one which had been constructed on the assumption that it would consume its own smoke; failing to do so, various smoke-preventing apparatuses were applied without success; the boiler was pronounced incurable. I undertook at my own risk to effect the cure, and succeeded. Our usual deflector plates not being adaptable, owing to the unusual diameter of the internal fire-box (nearly 5 feet), it was arranged that a temporary deflector should be fitted up to prove the fact, and that in the meantime, one of our improved and perfect constructions should be prepared. The apparatus answered most perfectly, and is highly commended by my clients and their engineer. The diaphragms at that time fitted, now stand as good as ever, will remain and await the new deflector, which, for all I know to the contrary, is now applied. At the factory of which I am now speaking, an apparatus was fitted (but not by me) more resembling Mr. Woodcock's; it was pulled out as valueless in less than ten hours after it was completed.

The communication to which Mr. Woodcock refers as "forwarded by Professor Gardner to Mr. ——," is another beautiful example of Mr. Woodcock's unscrupulous anxiety to catch at every straw, although never so unjust. This communication was addressed to Mr. Field, printing ink manufacturer, by Professor Gardner to prevent the prying curiosity of such mischievous individuals as Mr. Woodcock. It ran to this effect: "That Mr. Field was not to allow any person to examine my new apparatus for removing the *noxious effluvia arising from varnish making and other processes,* without my order;" it being my intention to secure by letters patent. Mr. Field was certainly indicted for a nuisance, but not arising from smoky chimneys, but from the varnish making process. Many contrivances which had been attempted by Mr. Field having in all instances to that time failed, Mr. Field consulted me professionally; the result was anything but that which Mr. Woodcock states. We fortunately devised a most perfect apparatus, by the aid of which the whole of the business proceeds without annoyance, as the following letter addressed to me about that time will prove:

"Printing Ink Manufactory,
"Maiden-lane, King's-cross,
"London, February 25, 1856.

"Sir,—I have the pleasure of informing you that your apparatus for preventing the '*smell*,' was approved of by Dr. Odling, of Guy's Hospital, and the summons for the nuisance was discharged this day.

"I am, Sir,
"Your obedient Servant,
"For M. A. Field,
"Wm. Staples."

"To Professor Gardner."

Can we wonder at Mr. Woodcock's repeated assertions, calling for correction, when he stays not at any means by which he thinks he can inflict an injury? Again, I am, and was under engagement, at a public institution, in London, to lecture on the "smoke question," and my readiness to give publicity to Mr. Woodcock's invention, amongst many others, showed, at least, as I intended it should, that I was impartial—that I considered no man my opponent, but desired to give place to all. I would, in conclusion, refer to one other remark of Mr. Woodcock's, although, perhaps, not addressed to me, in which he advocates, as his principle, the absorption of the visible carbon by the carbonic acid. Is this one of the luminous points upon which Mr. Woodcock was, in a former letter so careful of speaking, lest he should relieve our darkness, which latter he declared was, to him, so evident? If so, we can only regret that, were we to estimate "consulting engineers" by Mr. Woodcock's capacity, they would be anything but bright specks in the middle of the nineteenth century. The mere process of absorption of carbon, by carbonic acid, would tend to absorb a considerable amount of heat, instead of developing this necessary agent, which could not be equivalently returned by the after combustion of the gaseous compound of carbon; a point

wherein, I trust, none may be found sufficiently foolish to copy Mr. Woodcock. This is the double furnace principle with a vengeance, the economy of which is too well known to be trusted.

I am, Sir, yours, &c.,
EDW. V. GARDNER.

Laboratory of School of Chemistry,
24, Norfolk-street, Middlesex Hospital.
May 14, 1856.

MECHANICAL LOCOMOTION.

To the Editor of the Mechanics' Magazine.

SIR,—I do not clearly perceive whether Mr. Rock puts forward his explanation of the motion of an engine, with the crank below the centre of the wheel, as an attempt to sustain my view of that problem, or as an original exposition of his own working out; but in either case it is concurrent with, and auxiliary to, the theory which I have brought forward. As far as regards the case of the crank below the centre, his theory is identical with my own, and has been repeatedly propounded by me in your pages. The fourth column of his letter consists of a re-statement of my views, with the exception that he purposely omits to use the terms "fulcrum," or "lever," without which it is not possible to properly explain the matter, and so has made his statement, as I think, less intelligible than my own. But when he enters upon the case of the engine with the crank above the centre, he differs entirely from me, and adopting the language of "W." and others, declares that the engine is moved because the wheel cannot turn round (without slipping) without the engine being moved, and that it "is moved accordingly," which might be said with equal truth of the wheel of a wheelbarrow, though it is perfectly clear that in that case the propulsion is caused by the push at the handles; and it may be, and I believe is, equally true of the engine, that the wheels *are made to turn by forces in the engine*, instead of *by* their turning causing *it* to move; and Mr. Rock has already perceived it to be so in the under stroke. In my previous letters, I have pointed out that the case of the crank above the centre is but the converse of that of the crank below, and probably a little more study and experiment will bring this home to Mr. Rock.

Mr. Rock says, of the first case, that the pressure of the reaction against the wheels causes them to struggle to move onward, yet, when he takes the second case, he describes the same force, when applied to the axle of the driving wheel, as having no tendency to make it revolve, which I consider to be unsound and a contradiction; neither can I admit the soundness or importance of the rule which he lays down as a matter of much consequence in his preliminary remarks, namely, that a locomotive requires, of necessity, a point of support, besides that by means of which its progression is effected. I had contemplated that point some time ago, and perceived, to my own satisfaction, that a locomotive might, theoretically, be considered to maintain its balance on one pair of wheels, and that if it could move practically (as it could) one inch without the necessity of other supports, they were unnecessary to the theory of the engine; besides which, the front may be conceived to reach down to the smooth rails and slide along upon them; though, in my remarks, I have always had before my mind, and thought that every one else had, the ordinary locomotive (as stated in my first letter) and with its wheels complete.

Mr. Rock's letters have the merit, so much wanting in most of the previous ones, of carefully and continuously taking up and following out the subject.

"W." does not seem happy in his attempts to understand me, though I may be the party to blame. I do not state that Mr. Cheverton deals him heavy blows for not taking proper account of the reaction, but that I think he will always be laying himself open to such from Mr. Cheverton, as long as he neglects to take account of it; that is to say, will often be palpably in error from neglecting to consider a necessary condition. He also makes a strange mistake in his last letter in saying that the nearer the rower's hand gets to the rowlock the more its pressure increases, in contradiction to the fact, and to his own doctrine (and mine), that the oar is a lever of the second order. "W." is also in error in ranging me among those who denote themselves "practical men." I have nothing to say as to his remarks upon my boat theory, except that I cannot be expected to be much influenced by them when he tells us that he condemns it "for reasons analogous to those I have advanced in the case of the locomotive engine," the said reasons proving, if they proved anything, that the propulsion of wheel-barrows, waggons, and all wheeled vehicles whose wheels cannot turn round without slipping, without the vehicle moving, is caused by the turning of the wheels, instead of that being caused by the onward motion of the vehicle.

The parts which "W." points out in locomotive machines, as not being levers or fulcrums, do really give a fulcrum to the reaction when considered to operate against the adhesion; but no doubt there are connecting parts between the levers and fulcrums, such as rods and cords, which are

not all levers or fulcrums; but then they never modify the force, and only pass it on or connect the parts like the nails of a door.

I will conclude with giving an extract from "W's." last letter, slightly, but I think fairly altered. "How can a force or useful effect, applied in the wheel around the rim, be directly effective in propelling the engine? It must be transmitted to the engine itself by some means or other; and of course some part of the wheel which is in contact with the engine on which the useful effect is to be produced. No part answers to this condition, except that in contact with the axle-box." Now I ask, how is this force, revolving in the rim of the wheel, to get into the axle which is turning loose in its journal, and these propel the engine?

I am, Sir, yours, &c.,

C.*

To the Editor of the Mechanics' Magazine.

SIR,—You have inserted in your number of this day a long letter, which, you state, is intended to close a controversy on this subject.† I have not seen the earlier part of the discussion, but the letter of Mr. Rock contains statements so entirely opposed to the principles of mechanics, that I beg to submit that, you will hardly do justice to the numerous readers, who look for instruction in your pages, if you suffer them to remain without contradiction.

Mr. Rock asserts that "the fundamental condition necessary for continuous locomotion is, that the locomotive machine must have, at least, one point of support, besides that by means of which its progressive motion is effected." No demonstration is offered of this proposition, which is a simple mistake. This condition would not be fulfilled in the case of an engine, placed within a drum to work like a squirrel in his cage, for the series of points (a straight line) on which the drum is at any instant supported, are all in a precisely similar relation, and incapable of affording the independent support supposed to be necessary. But such an arrangement, even, is not necessary; two wheels on the same axis are all that are required; one will suffice theoretically, and might, perhaps, by a peculiar arrangement, be made sufficient in a practical experiment. The only condition necessary to be observed, is to keep the centre of gravity of the engine well below the axle, so as to prevent its rotation. No doubt some oscillation will take place, but, although this would constitute a sufficient objection to the practical use of such a machine, it would not prevent continuous locomotion. If I were constructing a model to work in this manner, I would suspend the boiler below the engine, and even below the level of the rails.

The result of the action of the engine is, that either it or the wheels must rotate on the axis. Mr. Rock assumes that, with a single pair of wheels, the engine must go round. But the motion which will actually take place is that to which there is the least resistance, and, if this be the rotation of the wheels and progressive motion of the engine, the latter will not rotate, but continuous locomotion will ensue.

Mr. Rock's fundamental condition being without foundation, his explanation of the phenomena of motion in a locomotive is of little value. The true explanation presents no difficulty; but after the intimation given in your note in to-day's Magazine, I will not risk offending against the canon of brevity by entering into the question. I shall, however, be ready to do so, on a future occasion, if you desire it.

I am, Sir, yours, &c.,

R. C. NICHOLS.

London, May 17, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

PFEIFFER, J. D. *Improvements in the construction of knives or cutters.* Patent dated October 5, 1855. (No. 2226.)

This invention consists in forming the body of the knife (of a paper-cutting machine, for instance) of two pieces of iron, kept together by screws, and which hold between them a plate of steel which forms the cutting edge, and is set up by screws pressing on its back edge, so as to project it a short distance beyond the pieces of iron; as it wears away by use and sharpening, it is protruded forward by the set screws.

SPENCE, N. *Improvements in cards for carding cotton and other fibrous substances.* (A communication.) Patent dated October 5, 1855. (No. 2227.)

* In a separate note, "C." requests us to insert a letter of his, which was received some weeks since, but has not been published. When forwarding it, he remarked, "it must be in your hands to do what is best." This we have endeavoured to do. We much regret having to exclude letters written in reply to others, but that course is forced upon us in more than one instance. Our correspondents, when they feel disposed to object to the manner in which editorial control is exercised, should remember that they are necessarily unacquainted with many circumstances which tend to modify our arrangements. We are perfectly confident that "C." will concur with ourselves in this matter.—ED. M.M.

† We have only resolved to exclude lengthy letters on the subject.—ED. M.M.

This invention consists in forming the transverse part of the staple or wire tooth with curvatures or bends, and in forming in the back of the card (in addition to the ordinary holes for the sides of the staple or wire tooth to pass through) a cavity adapted to these curvatures. When the tooth of the card is applied to the back thereof, the curved part of the staple will become embedded in the material of which the back is composed; also, by the said form of the transverse part of the staple, the elasticity of the tooth will be increased.

DICKENS, T. *Improvements in machinery or apparatus for spinning, doubling, and throwing silk, and doubling other fibrous materials.* Patent dated October 5, 1855. (No. 2230.)

Claims.—1. The use of a supplementary shaft or shafts for communicating motion to the spindles and bobbins, whereby they are mutually dependent for their rates of revolution, and may be disconnected from the driving power without stopping the whole machine. 2. The use of hooks or other instruments (which fall upon the breaking of a thread, and thereby cause the spindle and bobbin to be released from the driving power) for arresting the motion of the spindle and bobbin.

LEPAGE, F.C. *A new composition or new compositions of materials, which may be employed as a substitute for wood, leather, bone, metal, and other hard or plastic substances, and the method of manufacturing the same.* Patent dated October 5, 1855. (No. 2232.)

This new composition consists of a combination of saw-dust and albumen. Pure albumen extracted from eggs, blood, &c., is preferred for the purposes of the invention. Colouring or other substances may, if desired, be added to the saw-dust and albumen.

ROFFE, W. J. *Improvements in stoves or furnaces.* Patent dated October 6, 1855. (No. 2233.)

The patentee describes a stove (to be called "Roffe's Stove") in which are employed a receiver with an egg-shaped bottom, reflectors for spreading the heat, &c.

COUTINHO, A. *Improvements in the means of obtaining motive power or continuous motion.* Patent dated October 6, 1855. (No. 2234.)

This invention relates to a mode of "increasing the leverage power," and consists "of a prolongation of the lever," &c.!

WASHINGTON, J. *Improvements in apparatus for sweeping chimneys or flues.* Patent dated October 6, 1855. (No. 2236.)

These improvements consist—1. In obtaining expansion and contraction at the brush part of such apparatus by a mode nearly similar to that adopted for opening and closing ordinary umbrellas by ribs and stretchers, but differing therefrom, inasmuch as in the improved apparatus, there are two stretchers (answering to the rib and stretcher aforesaid) jointed together and having brushes secured to the joints, or thereabouts, the extremities of which stretchers may be free to move in slide grooves or guides, and connected to springs, to secure the expansion and contraction of the brush, whereby the stretchers will be caused to form a greater or less angle according to the variations of pressure, and the brushes will be caused to protrude from the rod, filling the chimney or flue, and yet may be so much compressed as to pass through a common chimney pot. 2. In joining together the parts of the canes or rods to which the head or brush is attached, by means of a joint, which is simply a nut having a left-hand thread which secures the common right-hand thread of the ordinary joint.

HUSTER, J. T. *Improvements in invalid and children's chairs.* Patent dated October 6, 1855. (No. 2237.)

A chair is arranged to move on four wheels, one on either side, and two at the back, all connected to the frame, composed of two sides and a back. The side wheels turn on axles on the three-sided frames. The hinder wheels are castor wheels, which, by their vertical axles, can turn in any direction. The seat and the arms are attached to the back part of the three-sided frame. The person using the chair may enter between the two side wheels. Each of the sides is provided with a folding crutch. In some cases a narrow adjustable seat is provided, such as will give support, and yet admit of using the legs in order to propel the chair. The parts are so arranged that when the seat is down, the chair may be used as an ordinary invalid chair, and be propelled by the two side wheels.

ROGERS, W. *Improvements in fire-arms.* Patent dated October 6, 1855. (No. 2239.)

This invention relates—1. To an arrangement by which two or more charges may be contained in one barrel, and fired therefrom by means of front and back action locks and percussion caps in succession. 2. To a means of strengthening the breech end of the barrel by case-hardening the same.

HUBBARD, J. *An improved sole for boots and shoes.* Patent dated October 8, 1855. (No. 2242)

The patentee makes the sole partly of leather and partly of gutta percha, and unites or combines them in the following manner:—From the leather sole he cuts out the tread, leaving a rim of leather all round, sloping the inner edges of the rim. He then takes a piece of softened gutta percha, equal in size and shape to the piece cut out of the leather sole, and places it in the vacant space, and unites it with the bevelled edges by pressure and gutta percha

solution, or in any suitable way. In order to make this sole perfectly waterproof, he lines the inner surface with thin leather or woven fabric, cemented to it by gutta percha solution; he then subjects it in its warm state to pressure in a suitable mould.

ROTHERA, W. *Certain improvements in machinery or apparatus for manufacturing bolts, screw-blanks, rivets, and other similar articles.* Patent dated October 8, 1855. (No. 2243.)

Claims.—1. The application of moveable bearings to shafts upon which any extra strain may be exerted. 2. The use of an inner and outer ram, the outer one for confining the spreading of the metal in forming the head of the bolt, and the inner one for forcing up the metal to form the head of the bolt, &c. The inner ram holds the bolt until the outer ram is gradually drawn from off the bolt. 3. A novel arrangement of machinery described.

JOHNSON, J. H. *Improvements in the method of and apparatus for rolling iron, more particularly applicable to the manufacture of the tires of railway wheels.* A communication. Patent dated October 8, 1855. (No. 2245.)

This invention relates mainly to the manufacture, by rolling, of railway and other tyres without welding, and consists principally of certain improved arrangements of mechanism, whereby such manufacture is more effectively performed, and the seam or ragged edge usually left by the "rolls" is entirely obviated. Two forms of "rolls" are employed, one pair for "roughing" or forming the tyre, and the other pair for finishing the same: similar mechanism is employed to actuate both descriptions of rolls.

NEWTON, W. E. *Improvements in condensers.* (A communication.) Patent dated October 8, 1855. (No. 2247.)

This invention mainly consists in making the two ends of the tubes which pass through holes in the tube sheet of a smaller diameter than the body of the tubes, and securing them in place by means of nuts screwed on to the ends thus reduced, so that the tubes may be put closer together than heretofore for the purpose set forth; and in the employment of a heater between the cylinder and the surface condenser, so arranged that the exhaust steam shall pass through the said heater on its way to the condenser, and thus heat the feed water in its passage from the air pump to the feed pump.

PARSONS, P. M. *Certain improvements in connecting and securing the joints of pipes and tubes.* Patent dated October 9, 1855. (No. 2249.)

To connect the joints, the patentee employs a socket having an internal circular recess or chamber, or otherwise so constructed that, conjointly with the ends of the pipes, it will inclose an annular chamber round the joint. The socket is provided with a small aperture, communicating with the annular chamber from without: through this aperture he passes a cord, band, or strip of suitable packing, and attaches its end, by a loop-knot or other suitable fastening, to one or both of the ends of the pipes brought together within the socket. He now causes the socket to rotate on the pipes, or *vice versâ*, and with it winds the packing round the joint, and thereby causes it to pass into the annular chamber. This is continued until the packing is sufficiently compressed in the chamber to make the joint tight.

MARTIEN, J. G. *Improvements in the manufacture of iron and steel.* Patent dated October 9, 1855. (No. 2250.)

This invention consists in subjecting malleable sponge, made by welding particles of deoxydized ore, and by the process of puddling, as heretofore, in lumps (or in a severed state) whether it be made direct from the ore or from cast iron, in part or wholly to the action of water or its elements, directly after it has been drawn from the furnace; also in adding to the water chlorine, saline, or alkaline matters.

MURDOCH, J. *Improvements in extracting colouring matter from lichens containing such colouring matter.* (A communication.) Patent dated October 9, 1855. (No. 2253.)

This invention is an improvement upon a process invented by M. Robiquet, for extracting the colouring matter from lichens by means of alcohol. The operator proceeds as follows: The lichen is placed in a distilling apparatus, and the colouring matter is extracted from it by successive decoctions in alcohol, the alcoholic vapours which are disengaged passing off by a pipe into a condenser, from which they are drawn off by a cock to operate upon a further portion of lichen. Before throwing away the exhausted lichen it is washed in a small quantity of water to extract the alcohol remaining. The small quantities thus obtained from successive decoctions are added together, and then evaporated in the distilling apparatus, and the alcohol thus disengaged serves in the decoction of a fresh portion of lichen. The extract remaining in the still when the alcohol is entirely drawn off is re-dissolved in water, as Robiquet directs, and drawn off at the cock. It is left to cool, and then thrown upon a filter which retains the resin dissolved by the alcohol, but which resin is deposited by the liquor in cooling. The liquor, after being filtered and evaporated, is brought into contact with ammonia, and a colour of great brilliancy is obtained.

MURDOCH, J. *Improvements in extracting colouring matter from lichens containing such*

colouring matter. (A communication.) Patent dated October 9, 1855. (No. 2254.)

Claims.—1. The extracting colouring matter from lichens by boiling them in liquid ammonia. 2. The collecting the ammoniacal vapours disengaged, by carrying on the boiling in a close vessel, to which a suitable condensing apparatus is attached. 3. The employment of certain described apparatus for carrying out the invention.

Belleville, J. F. *An improved smoke-consuming apparatus.* Patent dated October 9, 1855. (No. 2255.)

This apparatus consists of an inclined grate or set of furnace-bars fitted into a frame, and supported at an inclination upon suitable framework. The frame is free to move upon its axis, whereby the degree of inclination may be regulated. The fuel is fed in at the top through a hopper, and, falling on to the inclined grate or bars, descends gradually by gravitation, and as fast as the ignited portion becomes consumed, its place is supplied by the fuel next above it, and so on. The ashes, scoria, &c., fall into a space left for them at the bottom of the grate. The bottom of the ashpit is kept covered with a film or stream of water. The admission of air to the fire-bars is regulated by doors or registers, so arranged as to cause the currents to pass through the upper part of the grate.

Goldner, S. *Improvements in apparatus used in cooking and preserving animal and vegetable matters.* Patent dated October 9, 1855. (No. 2258.)

A hollow tray is formed for receiving the metal cases which contain the matters to be cooked and preserved. This tray is heated externally, by steam, or other heated fluid in a jacket, and over it is applied a moveable cover, the edges of which enter a sand joint. The cases are placed in the tray and heated therein, thermometers being used to indicate temperature, and there is an outlet to admit of the escape of the confined air and the vapours arising from the substances, such outlets being regulated by a cock or valve.

Leroy, N. *Improvements in the construction of railway carriages.* Patent dated October 9, 1855. (No. 2259.)

This invention consists in arranging railway carriages—1. With a longitudinal passage with arm chairs or seats ranged two and two, one behind the other on each side of it. 2. With a gallery or compartment fitted up with washing and water closets, and also with cooking and other apparatus necessary for dispensing refreshments; and, 3. With seats or beds in two tiers, one above the other, and the upper tier being under the roof of the carriage.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Grahame, T. *Improvements in the construction of floating batteries or vessels in order to render them ball and shot proof.* Application dated October 5, 1855. (No. 2225.)

The battery or vessel is to be constructed of iron, and in order to render the deck and the sides and parts from just below the water line to the deck, ball and shot proof, the inventor employs a considerable thickness of cork, and externally sheathes the vessel with comparatively thin sheet iron, so as to offer small resistance to the passage of ball or shot; and in order to prevent water following the balls which penetrate the outer skin of iron, he uses sheet India-rubber (which will close up) between the different thicknesses of cork, and also between the cork and the iron.

Hills, R. H. *A jointed back-band for gig or brougham harness, affording instant relief to fallen horses, and always inclining to the draught of the traces.* Application dated October 5, 1855. (No. 2228.)

This invention consists of a back-band made in three pieces, to be connected on either side of the saddle with a screw rosette, so that, in the event of the horse falling down, by unscrewing one or both rosettes instant relief is given to the horse.

Howell, J. B. *Improvements in the manufacture of steel castings for ordnance and other purposes.* Application dated October 5, 1855. (No. 2229.)

This invention consists in the manufacture of ingots or blocks of cast steel with an iron centre. The inventor places a bar of hot iron covered with a deoxydising agent in the centre of the mould, previous to pouring in the melted steel, and thus dissolves the oxide from the iron, and insures perfect cementation between the steel and the iron.

Wren, E. C. *An improved construction of child's cot.* Application dated October 5, 1855. (No. 2231.)

The cot is suspended from springs connected to the cross bar of the cot framing. The vertical rods which carry the cross bar form also guides, on which lugs attached to the opposite ends of the cot work up and down. A treddle, which works on a fulcrum formed for it at the foot of the framing, is attached by cords to the bottom of the cot, and the nurse, by alternately pressing upon the treddle and releasing it, will cause the suspension springs to expand and contract alternately, and thus a gentle up and down motion will be obtained.

Hoyle, B. *Certain improvements in the process of dyeing.* Application dated October 6, 1855. (No. 2235.)

This invention consists in certain processes for dyeing yarn and cloth in fast colours of a purple tint.

JOHNSON, J. H. *Improvements in apparatus for consuming smoke, to be applied to lamps and gas-burners.* (A communication.) Application dated October 6, 1855. (No. 2238.)

This apparatus is composed of two parts connected together, and suspended above the chimney of the burner. At the lower part of the apparatus is an inverted funnel, to receive the products of combustion as they issue from the chimney. The upper part of this funnel extends upwards into a bell, in the centre of which a projecting boss is formed for causing the ascending smoke to be distributed over the interior of the bell. The lower edge of this bell descends into another bell placed in an inverted position, and attached to the upper portion of the funnel above named. The upper edge of this inverted bell projects upwards into an outer bell, which forms the exterior of the upper part of the apparatus, and to which the inner bell is attached. These parts are so arranged as to leave an annular space for the passage of the gas. The effect is as follows:—"The smoke and gas evolved from the flame pass up the inverted funnel, carrying with them a portion of atmospheric air; the projecting boss of the inner bell becomes so heated thereby as to consume a great portion of the smoke and combustible gas. This effect can be increased by the application of wire gauze to the boss. The unconsumed portion of the smoke, in traversing through the several bells, becomes deposited in the form of soot, and can be easily removed."

HART, H. W. *An improved cannon for gun boats.* Application dated October 6, 1855. (No. 2240.)

This invention consists in constructing a long-range gun-boat cannon in two parts—by dividing the breech from the barrel—of sufficient length and of such calibre as to enable large shot to be discharged therefrom. The breech and barrel of the cannon are to be formed of laminated steel, each thickness twisted spirally, and welded together, and every layer coiling contrariwise, till sufficient thickness of metal is obtained. The cannon is made to move freely by a circular end at the back of the breech, which works in a corresponding socket, to admit of its easy elevation and depression by means of a series of levers put in motion by the steam machinery of the vessel. The bed is bolted to the deck, thereby causing the vessel to rebound instead of the cannon. Another feature, to prevent accidental explosion, is the moving forward and separating the barrel from the breech, so as to allow of the cannon being well cleaned after firing, and easily reloaded at the breech.

DENNER, J. *Improvements in furnaces for the consumption of smoke, drying tan, and other similar substances.* Application dated October 8, 1855. (No. 2241.)

These improvements consist in so connecting a fanner with the furnace as to produce a blast at the bridge, by means of a tube passing from the fanner through the ash pit, and terminating in smaller tubes which pass through the bridge and open on the surface. The drying of tan is effected by constructing, round the ambit, a frame-work, with suitable compartments for the reception of the matter to be dried, which is exposed to the blast of the fanner as it revolves in supplying blast to the furnace.

JOHNSON, J. H. *Improvements in machinery or apparatus for the transmission and conversion of motive power.* (A communication.) Application dated October 8, 1855. (No. 2244.)

This invention consists in attaching to the first mover two rollers, between which slides a connecting rod (at right angles to the line of movement) coupled to two cranks, one at each of its ends. These cranks are keyed each upon one end of their respective shafts, which are parallel with each other; at the other ends of these shafts are respectively keyed two other cranks which have a position at right angles to the former cranks, and are coupled by a second connecting rod.

HENRY, J. H. *Improvements in floating vessels for carrying goods and passengers on the water.* Application dated October 8, 1855. (No. 2246.)

The inventor constructs floating vessels in such manner that the body of the vessel shall be supported above the surface of the water, by means of hollow cylindrical floats, with curved ends free to revolve on their axles, and propelled by paddle-wheels applied on either side of the body of the vessel.

WILLAN, R. and D. MILLS. *Improvements in looms.* (A communication.) Application dated October 8, 1855. (No. 2248.)

In the manufacture of ribbed and similar fancy goods, instead of the usual counter shaft with its wheels and apparatus to work the treddles, the inventors make the tappet in halves, so as to slide to the right and left in a groove or key-bed on the tappet shaft, and use two bosses grooved in a serpentine or cam form, which bosses also slide on the tappet shaft with the tappets to the right and left. The treddle levers working into the said grooves during their revolution, work the treddles as in the old method of working them by the feet, by which the ordinary counter shaft and

its concomitant apparatus are dispensed with.

JAY, W. C. *An improved manufacture of collapsible hat or bonnet.* (A communication.) Application dated October 9, 1855. (No. 2251.)

The material of which the hat or bonnet is to be made is sewn on a framing consisting of any suitable number of jointed ribs, extending from the brim to the edge of the crown. The joints of the ribs are situated at the angle formed by the junction of the brim with the body, and when the hat or bonnet is to be collapsed, the ribs are folded back. In order to maintain the hat or bonnet in shape, when extended, moveable rigid ribs are inserted with the jointed ribs at proper distances apart, and are made to slide in and out of tucks made for the purpose.

ROWLAND, E., and J. ROWLAND. *Certain improvements in locomotive steam engines.* Application dated October 9, 1855. (No. 2252.)

This invention consists in the employment of a metal plate, covering the back of, and forming a slide for the slide valve of a locomotive, in order to avoid the pressure on the back of the valve, such covering plate being secured to the outer plate of the steam chamber by bolts and stop nuts, so as to be readily adjusted and rigidly secured, and yet allow free action to the slide valve; and in the employment of a valve of peculiar construction, placed between the two cylinders of locomotive engines, which may be actuated by the driver. The ports of this valve are so placed with regard to each other, that the steam may be admitted to both the cylinders at the same time, or by a slight shifting of the valve the ports before employed for the supply of steam to both cylinders may be closed, and other ports opened, allowing the working of either cylinder separately.

VION, E. F. *An improved tea or coffee-pot.* Application dated October 9, 1855. (No. 2256.)

This invention relates mainly to a peculiar arrangement of the filtering apparatus, which may be made to rise or lower according to the quantity of coffee put in it, and by this arrangement the filter, being always placed above the coffee, is prevented from being obstructed.

LANCASTER, W. H., and J. SMITH. *Consuming smoke, and for generating and diffusing heat in furnaces, and in furnace or other flues.* Application dated October 9, 1855. (No. 2257.)

This invention consists in employing hydrogen gas in combination with atmospheric air for the purposes of consuming smoke, &c., which may be effected by introducing a number of jets of hydrogen gas into flues and furnaces by means of pipes.

ONIONS, J. *A certain mode of collecting and means of applying for use, the smoke, heated air, and other gases arising from engine and other furnace fires.* Application dated October 10, 1855. (No. 2260.)

The smoke and gases from furnace fires are to be passed through certain tubes (forming the chimney or flue) and cisterns, by means of an air pump or pumps. The cistern is to form a purifier or regulator, and to prevent the dust from entering the pump, which forms a vacuum in the tubes and cisterns, in order to cause a draft in the furnace, and also to force the smoke, &c., into the places appointed for their consumption.

PROVISIONAL PROTECTIONS.

Dated March 11, 1856.

588. John Collins, architect, of Birmingham. A machine for pulverising, crushing, pressing, and cleaning land.

Dated March 31, 1856.

774. Gregory Bird, of Glasgow, Lanark, manufacturing chemist. Improvements in the application of asphaltic or bituminous compositions for building and structural purposes.

Dated April 19, 1856.

945. William Crosley, of Westbourne-park, Middlesex, gas-meter manufacturer, and George Goldsmith, of Leicester, gas-meter inspector. Improvements in wet gas meters.

Dated April 26, 1856.

999. Thomas Lawes, of City-road, Middlesex, feather merchant. Improvements in the construction and manufacture of an implement used in tilling the land.

1001. Malcolm William Hilles, of Percy-street, Bedford-square, Middlesex, surgeon. Improved apparatus, applicable to the treatment and cure of rupture, prolapsus uteri, and other protrusions of the viscera.

1003. Claude Antoine Arnaud, of Lyons, France, manager of the company called "La Rotative." Improvements in obtaining motive power from steam and other fluids, and in pumping and forcing water and other fluids. A communication.

1005. Alexandre Vacherot, of Paris, France, architect. Improvements in the construction of submarine tunnels.

Dated April 28, 1856.

1007. George Napier, of Bath-street, Glasgow, and John Millar, of Cavendish-street, Glasgow, Lanark. Improvements in the manufacture of gas from coal, tar, or other bituminous, resinous, or fatty matter.

1009. Thomas Restell, of New Kent-road, Surrey, chronometer maker. Improvements in fittings or appendages for doors, and in the means of fixing or attaching the same.

1011. William Denny Ruck, of Topping's-wharf, Tooley-street. An improvement in tanning hides and skins.

Dated April 29, 1856.

1013. John Hick, of Bolton-le-Moors, Lancaster, engineer. Apparatus for equalizing the tempera-

ture of the water in that kind of steam boilers generally called multitubular boilers.

1015. Thomas Greenshields, of Little Titchfield-street, London. Improvements in sleepers for railways.

1017. Thomas Webster Rammell, of Trafalgar-square, Middlesex. Improvements in pen and pencil holders.

1019. William Pilling of Oldham, Lancaster, manager. An improvement in the treatment of yarns or threads, and in the apparatus connected therewith.

Dated April 30, 1856.

1021. John Smith of Collyhurst, near Manchester, dyer and finisher, and William Craven, of the same place, engineer. Certain improvements in machinery or apparatus for dressing, machining, and finishing velvets, velveteens, and other fabrics.

1023. Samuel Dyer, of Bristol, ship owner. Improvements in reefing, furling, and setting the sails of ships and vessels.

1025. Louis Jean Baptiste Manevy, of Paris, France. Certain improvements in manufacturing cast steel.

1027. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. An improved method of, and machinery for, polishing the surface of glass, stone, metal, or other materials capable of being polished by friction. A communication from A. Broughton, A. Lindsay, and J. R. Platt, of New York, U.S.

Dated May 1, 1856.

1028. Nathan Defries, of Fitzroy-square, Middlesex, and George Henry Bachhoffner, of Montague-street, Middlesex. Improvements in gas fires.

1029. Henry Mapple, of Childs Hill, Hendon, Middlesex, electric engineer. Barometers.

1030. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. An improved preparation of phosphoric acid. A communication from E. N. Horsford, of Massachusetts, U.S.

1031. Claude Perron and Victor Boulland, of Paris, France. An improved knitting machine.

1032. Stephen Carey, of Clink-street Wharf, Southwark, Surrey, contractor. Improvements in water-carts and barrows.

1033. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in compressing, regulating the pressure and flow of, and conveying gas, parts of which are applicable to air and other fluid pumps. A communication from P. Hugon, of Paris.

1034. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in machinery for felting or planking hat bodies. A communication.

1035. Alexander John Paterson, of Upper Eaton-street, Middlesex, gentleman. An improvement in or connected with hawsers and other ropes or chains used in towing vessels.

1036. Nathaniel Smith, of Thrapston, Northampton, engineer. Improvements in clod crushing rollers, parts of which are applicable to other descriptions of rollers.

1037. Augustus Smith, of Wentworth-street, Middlesex, brush manufacturer. Treating vegetable fibres, in order to fit them for use as a substitute for bristles in paint and other brushes.

1038. Samuel Hunter, of Ravensworth-terrace, Gateshead, and Dock Anchor Works, Hartlepool. An improvement in anchors.

Dated May 2, 1856.

1039. John Cowley, of Quenington, Gloucester. Improvements in the manufacture of paper from straw and other vegetable substances.

1040. Richard Pearcy, of Manchester, Lancaster, machinist. Improvements in machinery or apparatus for twisting cotton and other fibrous substances.

1041. William Waite, of Cheapside, London. An improvement in the construction of sleepers and rails for railways.

1042. William Naylor, of Norwich, engineer. Improvements in power hammers and riveting machines, part of such improvements being applicable to the manufacture of bolts or rivets.

1043. William Day, of Campbell-road, Bow-road, Middlesex. Improvements in clod crushers or rollers for rolling, pulverising, or pressing land.

1044. Alexander Gordon, of Fludyer-street, Whitehall. Improvements in evaporating, boiling, and distilling fluids, and generating steam.

1045. Henry Edward Brown, of Summer-street North, Dublin. Improvements in the description of hinges denominated concealed hinges, for carriage doors and doors of every description.

1046. Samuel Rooke, of Birmingham, Warwick, manufacturer. A new or improved manufacture of stair rods.

1047. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in machinery for bending or shaping timber. A communication.

1048. Henry Atwood Thompson, of Lewes, Sussex, agricultural implement manufacturer. Improvements in hay-making machines.

1049. Robert Tolmie Campbell, of Washington City, U.S. Improvements in machines for reaping and mowing. A communication.

Dated May 3, 1856.

1050. Peter Armand Lecomte de Fontainemoreau, of Rue de l'Echiquier, Paris, France. Improvements in electric telegraphs. A communication from A. J. A. Dumoulin, of Paris.

1051. John Wright and Thomas Gorrery, manufacturers, of Sheffield, York. Improvements in railway carriage and other springs.

1053. Henry Duncan Preston Cunningham, of Gosport, Hants, esquire. Certain apparatus to be applied to boats to increase their buoyancy and stability.

1054. Wright Garside, of Vicar-street, Kidderminster, Worcester. A new and improved method of letting off the worsted or yarn from the bobbins employed in weaving carpets, and other similar fabrics in which bobbins are employed during the manufacture thereof.

Dated May 5, 1856.

1055. Caleb Bloomer, of West Bromwich, Stafford, chain and anchor manufacturer. Improvements in the manufacture of spikes and bolts.

1056. George Williams, of Cannon-street, St. George's-in-the-East, plumber. Improvements in fog and dark night alarm signals.

1057. William Bulmer, of Middlesborough, York, agent for bricks and tiles, and Isaac Sharp, of the same place, land agent. Improvements in the manufacture of bricks, tiles, and other articles from plastic substances.

1058. Isaac Holden, of St. Denis, near Paris, France, wool comber. Improvements in preparing and combing wool and other fibrous substances.

1059. Alfred Chadburn, of Sheffield, York, optician. An improved construction of pressure gauge.

1060. William Gregory, of Old Church-street, Paddington, Middlesex, building surveyor. An improvement in the construction of roofing tiles.

Dated May 6, 1856.

1061. Amedée Louis Beudant and Jean Louis Marie Paul Benoit, engineers, of Paris. Certain improvements in treating ores of copper containing arsenic and antimony.

1063. John Wright, of Upnor, near Rochester,

Kent, civil engineer. Improvements in apparatus for lowering ships' boats.

1065. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved apparatus for connecting boats with their tackle, and clearing or detaching them therefrom when lowered from on board ship into the water. A communication.

1067. Thomas Huckvale, of Choice-hill, Chipping Norton, Oxon. Improvements in implements for thinning and hoeing turnips and other crops.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," May 20th, 1856.*)

45. Raymond Kammerer and Charles Brewer. Improvements in electric clocks or time-keepers.

55. Richard Archibald Brooman. Improvements in machinery for boring and excavating. A communication.

66. George John Christian Erhard Hald. Improvements in the construction of stoves. A communication.

76. Henry Adcock. An improvement in casting iron and other metals.

110. Thomas Hill Bakewell. Improvements in ventilating, warming, and cooling rooms and other places.

113. Henry Law. Improvements in heaving-up slips for the repair or construction of ships or other vessels, and for a continuous-action purchase for the same, which is also applicable to other purposes.

130. Joseph Jesse Comstock. Improvements in generating steam. A communication.

132. William Westbrooke Squires. Improvements in preventing the bursting of pipes and tubes for conveying liquids.

135. Miguel De Bergue. Improvements in the permanent way of railways.

145. Joseph Marzolo. A reproductive organ, printing with known notes any musical fancies, and equally applicable to pianofortes, melodiums, harmoniums, accordions, and generally to all keyed musical instruments.

151. Isaac Barnes. Improvements in carriage lamps.

166. Peter Armand Lecomte de Fontainemoreau. Certain improvements in machinery or apparatus for manufacturing nails. A communication.

173. Henry Elliott Hoole. Improvements in stove grates.

183. Isaac Barnes. Improvements in the manufacture of knobs and furniture for doors, drawers, and other similar purposes, parts of which improvements are also applicable to the manufacture of cornice poles and other like articles.

191. John Gimson and George Gimson. An improved apparatus applicable to steam pipes used for the purposes of heating and drying, which said apparatus may also be used for other similar purposes where steam is employed.

222. John Wormald. Certain improvements in machinery or apparatus for folding, "fenting," and making up goods or fabrics.

225. Jean Baptiste Jules Hyppolite d'Auvergne. Improvements in portable writing or drawing desks.

226. Pierre Samain. Improvements in tables, stools, and other pieces of household furniture.

299. Elisha Smith Robinson. Improvements in machinery for lithographic and zincographic printing.

374. Gustave Louis Keller. A new kind or system of carpet or travelling bag.

447. James Durell Greene. An improvement in breech loading fire-arms.

467. Robert Baker Jones. Improvements in cooking apparatus.

497. George Tomlinson Bousfield. Improvements in power looms. A communication.

518. John Brierley. Improvements in machinery or apparatus for twisting and doubling yarns for mule banding and similar purposes.

632. Joseph Pegg. Improved steering apparatus.

748. Samuel Getley. Improvements in supplying and drawing water to and from cisterns.

774. Gregory Bird. Improvements in the application of asphaltic or bituminous compositions for building and structural purposes.

816. Samuel Fisher. Improvements in the manufacture of anchors, shafting for mill and engine purposes, axles, cranks, and spindles, and in the furnaces or muffles used in the said manufacture.

922. William Westley. A new or improved nail or spike.

923. William Tytherleigh. A new or improved method of coating or covering iron, or articles of iron, with copper or alloys of copper.

933. Peter William Barlow. An improvement in seasoning timber.

945. William Crosley and George Goldsmith. Improvements in wet gas meters.

973. William Peacock Savage. A machine for drilling and rolling land.

977. James Barbour. Improvements in sawing apparatus.

1003. Claude Antoine Arnand. Improvements in obtaining motive power from steam and other fluids, and in pumping and forcing water and other fluids. A communication.

1013. John Hick. Apparatus for equalizing the temperature of the water in that kind of steam boilers generally called multitubular boilers.

1032. Stephen Carey. Improvements in water carts and barrows.

1041. William Waite. An improvement in the construction of sleepers and rails for railways.

1057. William Bulmer and Isaac Sharp. Improvements in the manufacture of bricks, tiles, and other articles from plastic substances.

1061. Amedée Louis Beudant and Jean Louis Marie Paul Benoit. Certain improvements in treating ores of copper, containing arsenic and antimony.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

1853.

1206. Jean Jacques Joseph Jamin and Alexander Symons.
1215. John Lee Stevens.
1220. Charles Cowper.
1222. John Haskett.
1230. Edward Thornhill Simpson.
1244. William Fulton.
1245. Charles De Bergue.
1423. Joseph Westwood and Robert Baillie.
1545. Henry Goodall.

LIST OF SEALED PATENTS.

Sealed May 16, 1856.

2584. William Cooke.
2585. William Eassie.
2596. Joseph Shaw.
2597. George Collier and James William Crossley.
2598. George Collier and James William Crossley.
2601. Josiah Pratt and Thomas Radcliffe.
2602. William Smith.
2604. Richard Archibald Brooman.
2613. Francis Puls.
2618. David Simpson Price and Edward Chambers Nicholson.
2619. David Simpson Price and Edward Chambers Nicholson.
2627. William Munslow and Henry Wallwork.
2649. Jean Lobstein.
2666. Thomas Allan.
2704. Richard Hancock.
2608. William Ward.
2714. George Harrison and William Mitchell.
2756. Frederick Samson Thomas and William Evans Tilley.
2772. Joseph Hacking.
2796. James Cliff.
2872. John Hadden, Henry Hadden, Frederick John Hadden, and Charles Staunton Hadden.
231. Jean Hector Destibeaux.
476. Frederick Kersey.
516. Richard Archibald Brooman.
562. Henry Davis Pochin.
626. Robert Walter Winfield, John Simms, and Thomas Lloyd.
634. George Hills.
658. David Cope.

Sealed, May 20, 1856.

2610. John Poole.
2615. Peter Armand Lecomte de Fontainemoreau.
2616. Charles Frederick Clark and Manoah Bower.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

T. Almgill.—We will endeavour to give place to yours in our next.

P. Arrive.—Your communication shall be attended to.

B. Chererton.—Your letter reached us after the number for this week was made up, but had we received it earlier we could not have inserted it on account of its great length. We direct your attention to the remarks addressed to "C." in a foot-note on page 496.

CONTENTS OF THIS NUMBER.

Chadwick's Patent Water Meter—(*with engravings*) ... 481
Expression of Definite Integrals and Differential Coefficients by Means of Symmetrical Finite Differences. By C. W. Merrifield, Esq. 483
Sir James South and the Royal and Royal Astronomical Societies—(*continued from page* 437) ... 485
The Caloric Engine: Captain Ericsson's recent Patent. By an American Engineer—(*with engravings*) ... 487
Fairbairn and Haslem's Improvements in Railway Wheels and Locomotive Engines.. 489
American Improvements in Cannon—(*with an engraving*) ... 490
Foreign Intelligence:
Novel System of Iron Furnaces ... 491
Exsiccation of the Marshes of Ostia ... 491
Original Inscription ... 491
The Smoke Act and the Potteries ... 491
The late Mr. Elijah Galloway, C.E. ... 491
Coals, Cinders, and Culm ... 491
Analysis of Ornament. The Characteristics of Style. By R. N. Wornum (*Review*) ... 491
Woodcock and Gardner's Patent Furnaces ... 492
Mechanical Locomotion ... 495

Specifications of Patents recently Filed:
Pfeiffer ... Cutlery ... 496
Spence ... Carding Cotton ... 496
Dickens ... Fibrous Materials ... 497
Lepage ... New Hard Compound.. 497
Roffe ... Stoves ... 497
Coutinho ... Motive Power ... 497
Washington ... Sweeping Chimneys ... 497
Hester ... Invalids' Chairs ... 497
Rogers ... Fire arms ... 497
Hubbard ... Soles for Boots & Shoes 497
Rothera ... Bolts, Screws, &c. ... 498
Johnson ... Rolling Iron ... 498
Newton ... Condensers ... 498
Parsons ... Joints of Pipes ... 498
Martien ... Iron and Steel ... 498
Murdoch ... Colouring Matter ... 498
Belleville ... Furnaces ... 499
Goldner ... Preserving Substances. 499
Leroy ... Railway Carriages ... 499

Provisional Specifications not Proceeded with:
Grahame ... Floating Batteries ... 499
Hills ... Harness for Horses ... 499
Howell ... Steel Castings ... 499
Wren ... Child's Cot ... 499
Hoyle ... Dyeing ... 499
Johnson ... Gas Apparatus ... 500
Hart ... Gunboats ... 500
Denner ... Furnaces ... 500
Johnson ... Motive Power ... 500
Henry ... Floating Vessels ... 500
Willan ... Looms ... 500
Jay ... Collapsible Hats ... 501
Rowland and Rowland ... Locomotive Engines ... 501
Vion ... Tea pot ... 501
Lancaster & Smith Furnaces ... 501
Onions ... Collecting Smoke ... 501
Provisional Protections ... 501
Notices of Intention to Proceed ... 503
Patents on which the Third Year's Stamp-Duty has been Paid ... 503
List of Sealed Patents ... 504
Notices to Correspondents ... 504

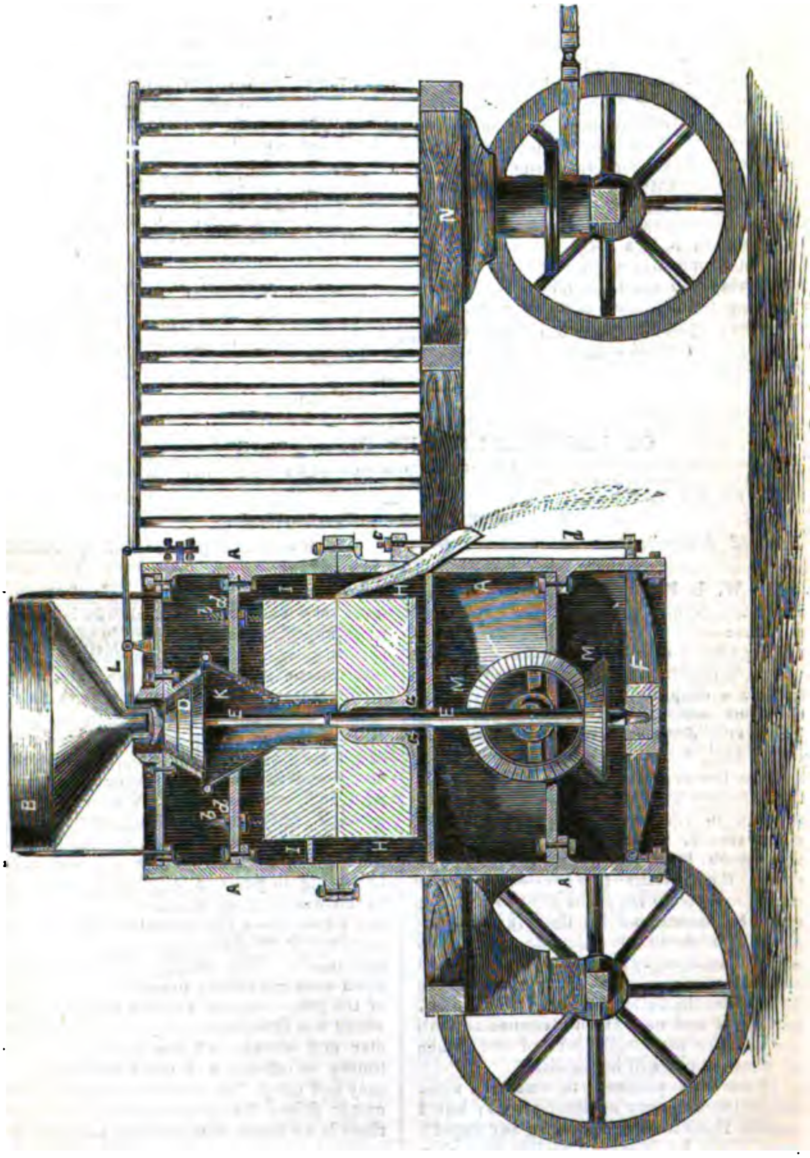
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1712.] SATURDAY, MAY 31, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

MOORE'S PATENT MILL FOR GRINDING CORN.



MOORE'S PATENT MILL FOR GRINDING CORN.

Mr. T. Moore, of Retford, has recently patented a very excellent mill for grinding corn and other grain, in which he has combined both steel and stone grinding surfaces. He forms the first and upper grinding surface of a vertical steel cone, which revolves in a correspondingly shaped fixed cone, and below these cones fits ordinary grindstones horizontally. The corn or other grain is fed into and between the steel cones from a hopper, and in its passage through them becomes very quickly bruised and converted into meal, for which purpose it is well known that steel mills are better adapted than stones. After being so converted, the meal falls between the horizontal grindstones, which reduce the meal into flour. The great advantage consists in apportioning each of the grinding surfaces to perform that portion of the grinding operations to which they are best adapted —the steel for converting the grain into meal, and the stones the meal into flour.

In the engraving on the preceding page is shown a sectional elevation of Mr. Moore's improved mill, set upon a carriage for the sake of portability. A A, is the framework; B, the hopper; C, a fixed cone, with teeth on the inside; D is a revolving cone, with teeth on the outside, which works inside the fixed cone, C. The cone D is keyed to the shaft, E, supported at bottom in a cup, *a*, in an adjustable lever, F. G is a bed for the running stone, made fast on the shaft so as to be supported upon and revolve freely with it; H is the running stone; and I, the fixed stone, held by screws, *b b*, which take into nuts sunk in the stone; K is a shoot for directing the meal into the stones and for admitting air between them; L is a regulator for regulating the feed from the hopper; M, bevil gearing for driving the shaft, E, and with it the running stone and cone; N N, carriage for removing the mill from place to place. The cones and stones are brought closer together or further apart by turning the nut, *c*, on the screwed-rod, *d*, connected to the lever, F, whereby the shaft E is raised or lowered. The upper stone is also capable of adjustment by turning the nuts, *d d*, or the screws, *b b*, whereby this stone is raised or lowered.

ON LARGE BELLS AND BELL MACHINERY.

(*Continued from page* 465.)

REMARKS ON THE FORMS, METHODS OF CASTING, AND RINGING OF LARGE BELLS. BY C. H. SMITH, HONORARY MEMBER.

Resumed Discussion at the Ordinary General Meeting of the Royal Institute of British Architects, Feb. 11*th*, 1856.

Mr. W. L. Baker, C.E., visitor, having requested permission, made the following remarks:

Large bells of a shallow basin shape are now used in some cemeteries, and are found to give a deep note, but weak in power; they thus possess the advantage of not being heard at a distance. But it is from the ogival bell, that the loudest, clearest, and best quality of sound may be obtained; we therefore find this shape almost universally adopted in the bells of our church and clock towers. The best modifications of this general form, the precise curves of the sweep, the various thicknesses, and the nature and treatment of the alloy to be used, must be determined by the practical experience of the bell-founder, who, no doubt, may be assisted by scientific research and careful experiment. It is therefore to be hoped that the details and results of all experiments and calculations connected with the bells for the clock tower of the Palace of Westminster will be published.

It has been proposed to cast bells without external beads or inscriptions; but I cannot think this omission of any importance, as the beads seldom project more than one-sixteenth of an inch, nor the lettering more than one thirty-second. It is much more important to get the inside of the bell perfectly concentric with the outside. The inscriptions generally give the date when the bells were cast, and are often otherwise interesting and instructive. Much has been said and written lately about the superiority of old bells over modern ones: the results of my experience do not entirely coincide with such statements, some of which are perhaps partly due to a natural tendency to find excellence only in the productions of former times. There are many old bells belonging to peals in country places, that have a diameter of mouth equal to sixteen and a half times the thickness of the sound bow, and their sound is consequently weak and panny. The tuning of old bells was often very imperfect, probably on account of the great expense attending the process, which was done entirely by hand with hammer and chisel. At the present day the tuning is effected with much greater accuracy and much less expense by a revolving cutter driven by steam power; but still there is no doubt that modern bells are in many instances anything but what they

ought to be; and I have lately discovered in examining a new peal of bells, what appear to me very startling anomalies both in their shape and thickness. We have also heard high praise of foreign bells. I have heard bells in France, Portugal, and Brazil, and my impression is, that on an average, French and Brazilian are inferior to the bells of this country. There are, however, some excellent bells in the Cathedral at Lisbon. I saw last summer the great bell, the "Bourdon" of Notre Dame, at Paris; the diameter of its mouth is eight feet six inches and three-quarters, and the thickness of sound-bow is eight inches; it weighs about fourteen tons, and although only used on the *grandes fêtes*, the indentations made by the clapper are 1¼ inch deep.

The effect of ringing is very different from that of merely striking bells while stationary, or, as it is technically called, chiming them. In ringing, a bell is made to perform a series of oscillations, and is struck once at each oscillation; it thus throws off the sound in a great number of directions owing to the arc it describes, and may be said to cause the air to vibrate in a series of rings expanding in an infinite variety of non-parallel planes, which intersect one another, and cause that pleasing undulatory vibration in the air so peculiar to ringing, and which cannot be obtained by chiming, or in any other manner.

A suggestion has been made during this discussion by Mr. Varley, to hang bells above the ridges of tower roofs. Bells may be seen hung in this way in France, and, under suitable circumstances, the same plan might be adopted in this country. The bells of the churches at Rio de Janeiro are all hung in the tower windows, and some of them are of considerable size, one bell always taking up the entire width of a window. I have never observed more than four bells in the same tower. They are hung upon immense ornamental wooden stocks, the gudgeons of which run in bearings let into the granite sides of the windows, so that no frame is required. The stocks have one, and in the case of heavy bells, two levers attached to them, projecting inwards at an angle of about 30° or 40° above the horizontal line; short ropes are attached to the levers, and the blacks who are employed to ring the bells stand on a floor in the tower, placed on a level with the bottom of the bell windows, and with the simple tackle I have described manage to raise very heavy bells and to set them without stays and catches. Bells thus hung in tower windows are very picturesque objects, and probably there would be no objection to a few irregular sized bells being thus placed. But it is quite out of the question to think of hanging peals of bells in this way, because the different positions of the bells in reference to the surrounding neighbourhood, causing some to quite overpower others, would seriously interfere with the beauties of change ringing, and there would be many objections to hanging them all in windows on one side of a tower.

Some towers, from their positions and proportions, are no doubt better calculated to do justice to bells than others. The clock tower of the Palace of Westminster stands boldly out from the surrounding buildings, and rises to a considerable height above them. I have heard with astonishing distinctness, in the neighbourhood, the noise of the hammers and chisels of the workmen engaged in the erection of its iron roof. The fine position determined upon for the large hour bell resembles that suggested by Mr. Varley of a bell hung above a conical roof with a sounding board over it.

Mr. Smith has particularly alluded in his paper to the injury occasioned to towers by the lateral strains to which they are subjected by the ringing of the bells, and Mr. Ferrey has stated that he has had "frequently to deplore the serious injuries caused to the towers by the action of the bells." My own experience is more limited, but I have been in many ringing rooms and bell chambers during the ringing of peals, and have often placed my back against the wall so as to become more completely sensible of the nature of the oscillations of the tower. These have invariably appeared to be of an elastic character, and it is evident that in a well built tower, oscillations not exceeding the limit of elasticity of the material of which it is constructed cannot injure it or interfere with its stability. The floor of the ringing room of St. Martin's-in-the-Fields is about on a level with the top of the balustrade over the cornice of the church, and even at that level the tower oscillates very considerably during the ringing of a peal; but good workmanship and the elasticity of the materials have prevented its peal of twelve, weighing about 147 cwt., doing it any injury; in fact, the tower is as sound now as ever. Another feature peculiar to the movement of a tower during the ringing of a peal is, that the consecutive arrangement of the bells in certain changes will cause it to oscillate very considerably, while during the ringing of other changes no oscillation will be perceived. Church towers are much better built now than they were twenty or thirty years ago, both in regard to their size and stability, but the internal arrangements of the bell chamber and ringing room are often, in many respects, inconvenient. In some, built within the last ten years, the ringing rooms are the chambers immediately under the bell lofts. They

are consequently so noisy and confusing to the ringers that it is next to impossible to ring complete peals in them. A double ceiling would in some measure remedy the evil, but an intermediate chamber between the bell loft and the ringing room would be still better.

Bell frames should be made as perfectly rigid as possible, and all tendency to twist provided against. If laid on a stout floor, they would be stiffened by being well secured to it, especially if the flooring boards were laid diagonally. The floor should be well spiked to the girders. The plan, described by Mr. Ashpitel last year of laying the frames, floor, and girders without fixing them to one another, would not reduce the thrust on the tower, and would allow them to work about in a very objectionable manner, causing great additional labour in ringing the bells. The more rigid the frame the easier the bells travel. Iron frames, therefore, properly constructed, are better than wooden ones, with the advantage also of greater durability. My model on the table shows a cast-iron frame for a single bell of large size; a horizontal diagonal brace introduced below the bell counteracts any tendency to twist. This brace is raised from below and bolted in its position after the bell has been hauled up into its place. Bells are more conveniently accessible when the frames are not laid on the floor, but the latter is fixed 4 feet 6 in. or 5 feet below the lowest parts of the framing. This arrangement gives access under the bells to the clappers, and allows the loft to be freed from rubbish, great quantities of which are sometimes brought in by birds, but should not be allowed to accumulate and rot on the floors or between the bell frames.

In France the louvre windows of bell towers are frequently of gigantic proportions, the bells being suspended in an immense wooden frame of vertical, horizontal, and diagonal timbers, built up from the bottom to the top of the windows, like an internal and independent tower. The 14 ton bell at Paris, to which I have already alluded, and three smaller bells, are hung in a frame of this kind, the louvres being attached to the bell-framing. Although the extreme angle described by the centre line of the 14 ton bell, when ringing, is only equal to about 90°, the frame oscillates considerably with it, north and south; and even when the oscillations of the bell become very small after it has ceased to sound, the lateral movement of the frame and louvres may be seen from the street below. Any movement in a bell frame is objectionable, and shows that it is not equal to its work. Peal ringing is unknown in Paris, and the bells (of which I believe there are not more than from one to four in each church) are universally rung by the feet of the ringers standing above the bells, by means of treadle levers bolted at right angles to the sides of the stock near its ends. With the present arrangements, eight men only can conveniently be engaged at the same time in thus ringing the 14 ton bell at Notre Dame.* The operation appeared to me awkward and attended with some danger to the ringers.

It was stated in the previous discussion that when the crown is let up into the stock, a bell will be raised with more difficulty than when it is attached to a stock which is straight on the underside; and that the greater the centrifugal force developed by the swinging of any bell, the more easily will it be raised. Now in raising a bell, a man imparts as much force as he is conveniently able to supply; and as long as the force continues to be greater than that required to overcome the resistance of the air and the friction of the gudgeons, and thereby to maintain the oscillations of the bell in any given arc, the remaining force causes the bell to describe a greater arc at each oscillation, till ultimately it is completely raised. The time of oscillation and the angular velocity of any given bell will be about the same, whether the crown is let into the stock or is attached to a straight stock; the actual velocity of the mouth will therefore be greater in the latter case, the bell will meet with more resistance from the air, and will consequently require more power to raise it; the centrifugal force will also be greater than in the former case, and therefore the friction of the gudgeons will be increased, occasioning still further exertions on the part of the ringer. With a straight stock the whole work to be done is greater, as the centre of gravity of the moving mass has to be raised through a greater distance, and the same amount of power being applied, more time will be required to raise it. The following advantages, then, are obtained by letting the crown of a large bell into the stock; it is raised with not only less effort on the part of the ringer, but also in less time; there is less strain on the stock and the bolt or bolts connecting the bell with the stock; there is a less lateral thrust on the tower; and lastly, the framing in which it hangs not only

* Mr. Papworth, Fellow, has communicated the following particulars of bells in Germany:—Olmutz, 358 centners (about 17 tons 18 cwt.); Breslau, 1507, St. Elizabeth's Church, 220 centners (about 11 tons); Gorlitz, SS. Peter and Paul Church, 217 centners (about 10 tons 17 cwt.); Halberstadt, the Dominica, 1457, 150 centners (7 tons 10 cwt.); Dantzic, St. Maria Church, 1453, 121 centners (about 6 tons 1½ cwt).

requires less strength, but may be made more compact, and consequently less expensive. With respect to the clapper going up on the wrong side when the bell is raised, I do not conceive that that practically influences the raising of the bell one way or the other. There is scarcely a tenor bell in London, the clapper of which does not go up on the wrong side, the only practical disadvantage being that a man has to go up and turn it on the right side, after which the bell will clapper just as well as if it had been raised with the clapper on the right side.

The following facts will clearly show the advantage of letting the crown of the bell into the stock.

The bells of Bow Church, Cheapside, after twelve years' silence, were re-hung in the year 1835, and the crown of the tenor bell was let up further into the stock. Since the alteration that bell, weighing 53 cwt., has been rung by one man for four hours and five minutes in a peal of 6,000 changes, whereas before the alteration it had never been rung single-handed in any peal.

The 42 cwt. tenor of St. Michael's, Cornhill, was never rung single-handed till the year 1840, when its crown was let further up into the stock, and since that alteration it has been always rung in peals by one man.

At St. Giles's, Cripplegate, we find a peal of twelve bells, the tenor being 36 cwt. In the year 1843 they were re-hung, and the crowns of the larger bells were let up further into the stocks. In the year 1851 a peal was rung in this tower, consisting of 7,524 changes, in five hours and twenty-four minutes, during the whole of which time Mr. John Austin, then between fifty and sixty years of age, rung the tenor bell unassisted.

The ordinary wooden slider, alluded to in the discussion on bells last year, is a bar of wood lying across the bottom of the cage in a horizontal direction; it is fixed at one end, and is generally made curved, in order to clear the skirt of the bell and the ball of the clapper, and at the same time to get the other end close up under the mouth of the bell within the range of the stay, the length of which is limited by the framing. The slider must therefore generally be a piece of carpenter's work, and not a mere stick. This kind of slider is replaced in my plan of hanging bells by a vertical iron catch, which is not only simple and strong, but occasions much less friction than a horizontal slider.

(*To be continued.*)

ON PETRIFACTION:

EXPERIMENTS SHOWING THAT IN WHAT IS CALLED PETRIFACTION, ANIMAL MATTER IS CHANGED INTO CARBONATE OF LIME, AND VEGETABLE MATTER INTO SILICA, PROBABLY BY PROCESSES SIMILAR TO INFILTRATION.

BY HORATIO PRATER, ESQ.

The small fossil shells found by me about half way up the mountain behind the "Tombs of the Queens," at Thebes (Egypt)—an altitude, I suppose, of nearly 1,000 feet above the Nile—dissolve with effervescence *entirely* in dilute muriatic acid. They therefore consist of the carbonates of lime and magnesia. Those shells found near the "Tombs of the *Kings*" are much larger than the above; but on breaking one up, and touching the *centre*—which is equally hard with the exterior—with muriatic acid, a vigorous effervescence took place. The animal matter, therefore, in all these cases is either *changed* into the earthy carbonates, or has been dissolved and *replaced* by such earthy ingredients. Fossil shells are found in like manner embedded in the limestone rock behind the citadel at Cairo, and the *interior* of these shells also, as well as the exterior, consists of earthy carbonates.

As in this case, and also at the Tombs of the Queens, the *contiguous* rock is soft carbonate of lime, the opinion that this has been dissolved and made to take the place of the animal matter, would appear more plausible and probable than an actual conversion of the animal matter into carbonate of lime. The great *hardness* of the carbonate of lime would perhaps incline us to think that such conversion or deposition was made while the lime was in a state of fusion; but I shall quote afterwards a fact that will rather incline us to believe it to have been effected by a deposition from water, particularly as the process must have been *extremely* slow, since the organic texture is preserved.

The *crystallized* carbonate of lime from "Belzoni's Tomb" at Thebes does not dissolve altogether in muriatic acid. It leaves, I presume, nearly half its bulk behind in the form of semi-transparent softish matter, probably silex. In like manner the large masses of very *hard* stone taken from near the grottoes of Dayr and Nackl, and found in greater or less quantity in the vicinity of all the limestone cliffs of the Nile, effervesced briskly in muriatic acid, but soon afterwards remained unacted on further. The white hardish mass left behind was probably above half; and as the rock itself scratched glass, the part insoluble in muriatic acid, though heated, was probably silex. These large masses, therefore, are justly

called "*silicious* limestone," consisting, as they appear to do, of a *fused* mass of chalk and silex. That they have been fused is also clear from their rounded form in several parts. Such hard round masses I observed in the top of one of the grottoes of Dayr and Nackl, embedded in the softer chalk, constituting a real "pudding stone" ceiling. As these round masses effervesced in muriatic acid, they are not *silica only*, as is often stated in books, but a fused mass of this and carbonate of lime.

FOSSIL WOOD.

This is found a few miles out of Cairo, in great part on the summit of a hill in the desert, also still further on towards Suez and near the Natron Lakes. *One* of the pieces examined effervesced in muriatic acid for some time, but the *greater* part of the mass of wood remained unacted on. The part dissolved gradually fell from solution, but was totally soluble in hot water. This specimen, therefore, contained a considerable quantity of carbonate of lime; but other specimens neither effervesced nor dissolved in the slightest degree in muriatic acid.

It was not fused, but only slightly blackened throughout, by being kept an hour or two in a fluid mass of silex and potass.

It was very easily reduced to powder in an iron mortar, and neither in this state nor in small pieces was it dissolved; nor did it take fire, as charcoal does, when thrown into hot fused nitrate of potass.

When the powder was intimately mixed with potass and exposed to heat, it also fused as silica does.

Exposed to a red heat, this fossil wood blackens to a certain extent. As fossil shells are found in chalk, so this petrified wood is found lying on sand, a strong argument against those who have thought carbon convertible into silica. The grand question on this subject is, whether the solution of silica that surrounded the wood was a *fused* mixture (as with potass or soda) or an aqueous solution. Since the wood retains its appearance so perfectly, one point seems clear—that the *silicization* took a very long period to complete, and that the wood was in a position to resist putrefaction. The formation of so hard a substance as the enamel of the teeth from a cool watery solution, is in favour of the silica not having been in a state of fusion at the time of its deposition. Another argument in favour of the same view (which applies equally to the carbonate of lime which took the place of the animal matter in the shells found above the Tombs of the Queens), is the following change in wood, found in cutting a canal near Ferry Bridge.*

"When a little water entered this peaty and shelly deposit, from the upper magnesian limestone, it produced in the wood a singular petrification; for the external bark and wood were unchanged, but the internal parts of the wood were converted to carbonate of lime, in which the vegetable structure was perfectly preserved. In like manner some of the nuts were altered; the shell and the membranes lining it were unchanged, but the kernel was converted to carbonate of lime, not crystallized, but retaining the peculiar texture of the recent fruit." It is singular that sulphuret of iron was retained *outside* this same wood, the "elective molecular attraction," as Phillips terms it, being for the carbonate of lime.

As a solution of carbonate of lime *permeated* (?) the wood in this case, we have no reason for supposing anything like a *transmutation* of the woody fibre or kernel of the nut into carbonate of lime. And from analogy we may say the same of the interior of the shells, which are filled with carbonate of lime. They have probably laid a very long time in such solution, which I believe has an antiseptic power, and hence is well calculated to keep the animal matter in the interior from putrefaction, while the lime is gradually taking its place. I proved by experiments many years ago that carbonate of soda has an antiseptic power (see *Phil. Magazine.*)

I shall here state what I believe to be a new discovery, viz., that carbonate of lime undergoes fusion at a certain heat, *when surrounded by an atmosphere of carbonic acid gas, without any assistance from pressure.* "Sir J. Hall discovered that limestone undergoes fusion under *a pressure* which prevents the escape of its carbonic acid," viz., 173 atmospheres, equal to a column of sea-water of 5,700 feet.* I have repeated the experiment above alluded to, which I first performed several years ago, lately, in the following way. Some chalk powder was put at the bottom of a crucible; over this was spread a pretty thick layer of nitrate of potass, in which were pieces of plumbago, common charcoal, and silica; over this, again, was a thin layer of chalk, and the whole was covered with common earth, and heated to redness for two or three hours. On examination, the chalk above and below the nitrate of potass was fused into a *hard*, porous, grey mass, something like some kinds of lava, the pieces of plumbago and charcoal had totally disappeared, having been converted into carbonic acid gas by the oxygen of the nitrate of potass; the piece of silex was changed to an opaque white by the heat, but otherwise unaltered.

* "Phillip's Treatise on Geology," vol. ii. p. 80.

* "Phillip's Geology," vol. ii. pp. 52, 95.

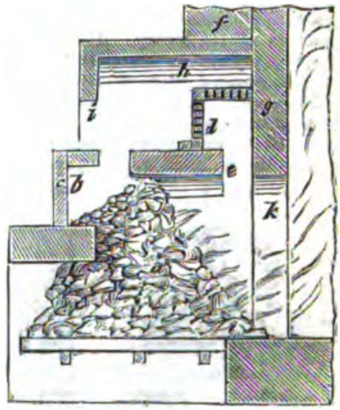
I have no doubt that many of the very hard masses of carbonate of lime seen on the banks of the Nile have been fused in a manner somewhat similar to the above, since the enormous pressure that Sir J. Hall employed can occur only occasionally in nature, and in subterranean parts. An excess of carbonic acid gas is well known to assist the solution of carbonate of lime *in water*. In the above experiments we also observe that it tends to render it *fluid* by fusion.

P.S. (April, 1856.) In conclusion,—although, as above stated, I consider it *more probable* that no *actual conversion* of the animal matter contained in the shells took place into carbonate of lime, nor of the wood into silica, still, at present, the new views of Mr. Low and M. Dumas on atomic weights and substitutions, and, above all, the *fact* that certainly carbon, sulphur, and *now* phosphorus (Schrötter's recent discovery), and perhaps oxygen (Schönbein), can exist in *two different states* (having different properties in each!) incline me to consider it *not impossible* that calcium and silica may sometimes be formed by vital, or even by inorganic processes. A third edition of Mr. Low's work "On the Simple Bodies" has just appeared (1856: Adam Black, Edinburgh), and though, perhaps, too prone to speculate rather than experiment, this gentleman has done a service to science by its publication. The neglect of his work by our men of science, of which he complains with justice, was to be expected, as, whether right or wrong, he is clearly too bold and original a thinker for the scientific powers of the day. It is rather amusing to find a good chemist, as he is certainly, writing in his last work in reference to the above discoveries, that the age of alchemy seems coming again, and yet *cautiously* avoiding all mention of Mr. Low's book *anywhere in his whole work*.

THE SMOKE ACT AND THE POTTERIES.

In our last number we directed attention to a design of Mr. Woodcock's for improving the combustion of fuel in pottery kilns. On subsequent inquiry, Mr. Woodcock has discovered that his arrangements have been anticipated by Mr. Doulton, of Lambeth, who patented an invention of substantially the same character as Mr. Woodcock's on the 11th of May, 1854. (See *Mechanics' Magazine*, vol. 61, page 567, No. 1635.) Mr. Woodcock has directed our attention to the circumstance, and at once resigned all claim to the improvement, which has been found to answer well in practice.

Mr. Doulton's arrangement is shown in the annexed engraving, which represents a section of a fire-place or furnace of a kiln where fire-bars are used; *a* is the fire-place or furnace into which the fuel is placed through the opening, *b*, to facilitate which the tile or slab, *c*, is taken away and then replaced: *d, d*, are perforated fire-tiles over



an opening, *e*, at the upper part of the fire-place or furnace; *f* is part of the outer wall of the kiln; *g* is part of the lining of the kiln; *h* is a chamber above the perforated fire-tiles, which can be partially closed by introducing a tile or brick, or otherwise, at the opening, *i*, to reduce the quantity of air passing into the chamber, *h* (and consequently to the fire), when the coal has become well ignited. There may be further perforated tiles used above those shown to partially heat the air before it comes to them. *j, j*, are bricks piled, as heretofore, loosely at the lower part of the furnace or fire-place, as shown, between which air can pass to support combustion, as well as down through the fuel from the chamber, *h*. By these arrangements the perforated tiles, *d, d*, will become highly heated, and the atmospheric air will become heated in passing from the chamber, *h*, downwards through the perforated tiles into the upper part of the furnace or fire-place, and will enter above the fuel therein, and thence pass into the kiln through the opening, *k*, where it will meet with the products passing off from the fuel, and become ignited with them as they enter the kiln.

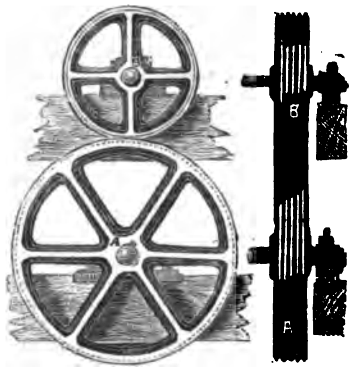
ROBERTSON'S GROOVED-SURFACE FRICTIONAL GEARING.

In our Number for October 21, 1854 (No. 1628, vol. lxi., page 395), we described a system of wedge-gearing for machinery, the invention of M. Minotto, of Piedmont, which was intended to be substituted for common-toothed wheels. We

have recently had submitted to us a system of gearing which bears some resemblance to M. Minotto's, but which appears to us to be much superior to it. Mr. J. Robertson, of Ardrossan, is the inventor of the new system, which resulted from certain experiments performed by him with a view to effect improvements in the reversing movements of machinery. It consists in employing pulleys or discs, the edges of which are grooved or corrugated, so as to take into each other, and to present to each other large surfaces of contact.

Fig. 1 is a front view of one arrangement of this frictional gearing, applied in

Fig. 1. Fig. 2.



its simplest form, for obtaining a quick speed of a driven shaft; the pulley, A, being the driver, and B the driven pulley. Fig. 2 is an edge view of the arrangement.

It is quite unnecessary for us to occupy the attention of our readers with any statement of the different relative positions which the driving and driven parts to which Mr. Robertson's improvement is applied may occupy, since these may evidently be varied at pleasure, or according to circumstances. The invention is essentially described in what has already been said.

THE BRUSSELS ECONOMIC EXHIBITION.

The committee appointed by the council of the Society of Arts in aid of the Economic Exhibition to be opened at Brussels on the 25th of August next, has received very favourable communications from the Belgian commissioners. Promises of contributions have been sent in from Germany, Switzerland, France, and Holland, and the Commission being particularly desirous of securing the co-operation of British manufacturers in this undertaking, has used every endeavour to render it deserving of their support, both in a commercial and in a benevolent point of view. This exhibition is to be held in connection with an International Congress, for promoting health and comfort among the poor; it is intended to form the ground work of a permanent economic museum, and it will comprise specimens or illustrations of articles or contrivances which may enable the working classes to improve their condition as to their dwellings, furniture, and household utensils, their food and clothing, their industrial pursuits, and their intellectual development. As the exhibition will be visited by a number of individuals from various countries, and the catalogue will be widely circulated, this will amount to an extensive advertisement in favour of the exhibitor. The Belgian government has agreed to deduct fifty per cent. from the usual railway charges, and the Exhibition Commission will bear all charges in Brussels—such as cartage, stalling, and exhibiting the goods.

Should the exhibitor desire to sell his articles, the commission offers assistance for that purpose.

Contributions may be consigned to Messrs. Mertens Krupel and Co., 8, Catherine-court, Seething-lane, London, the agents for the Belgian Commission. If the articles are to be returned to England at the close of the exhibition in October, the expense of conveyance to and from Brussels will be borne by the contributors; the charge from London to Brussels will be at the rate of one shilling per cubic foot. The same will be charged for the return of goods from Brussels.

If the articles are presented as donations to the Belgian Government for being exhibited permanently in the proposed museum, the contributor will incur no trouble or expense beyond consigning his contributions to Mertens Krupel and Co.

No customs duties will be charged, unless the articles are sold in Belgium.

A detailed programme of the exhibition has been translated into English, and may be had on application to the secretary of the Society of Arts.

TRIAL OF STEAM-FIRE ENGINES.

On the 6th instant a trial of steam-fire engines took place in the Park, this city (New York), to compete for three prizes, of 500, 300, and 200 dollars, for the first, second, and third best. Only two engines appeared really as competitors—that of Lee and Larned, with Carey's pump, and a new one by Messrs. Burnham—all of this city. Another, constructed by J. Smith, was on the ground, but this is all the notice it requires—it was a mere toy. The contest was between the

engines of Lee and Larned and Messrs. Burnham. In twelve minutes after lighting the fires, the engine of the former party was at work, while that of the latter took twenty minutes. Both of these engines threw good streams of water—but the rotary pump the best. Burnham's is constructed with two vertical steam cylinders and pumps; its workmanship was coarse, as if the whole engine was too hastily constructed. It contains some good features, and might be made to operate better. The engine of Lee and Larned leaked a great deal of water and steam. To us the experiment was not so satisfactory, as far as it relates to the condition of the engines.—*Scientific American.*

THE NEW ATLANTIC TELEGRAPH CABLE.

The cable of the New York and Newfoundland Telegraph Company, which was lost from the steamer *James Adger*, weighed five tons to the mile, had three conducting wires, each about as thick as a knitting-needle, and a flaw of either of these was sufficient to stop the electric current from one end to the other.

The new cable now making in England will be made of small copper wires twisted together, and will not be more than half the thickness of the old cable. According to the contract, this should be laid and in working order next month.

The trans-Atlantic cable will have but one conductor made like the above, and will weigh about three-fourths of a ton to the mile. The distance from St. John's, Newfoundland, to the nearest point on the southern coast of Ireland is 1,647 miles. The cable will be 2,400 miles long, and is to be laid by two steamers, each of them to have on board 1,200 miles of cable, weighing 900 tons. After joining the ends of the coils, and dropping them in the ocean midway between the two points they are to connect, they will start for their separate places of destination. It is estimated that ten days will be required to accomplish this work.—*Ibid.*

BONELLI'S IMPROVED ELECTRIC CONDUCTORS.

M. Bonelli proposes, in order to reduce the cost, &c., of insulated, electric, and galvanic conductors, to substitute for the ordinary insulated copper or other wires, metallic lines ruled upon strips of paper, or other suitable material. He has already constructed a coil for a galvanometer, and another for an electro-magnet upon this principle, and is now engaged in making the necessary calculations for determining the laws to be observed in applying it to the construction of electric apparatus generally.

FOREIGN INTELLIGENCE.

Scientific, Engineering, Architectural, &c.

Railroads in Towns.—The question whether railroads in towns will compensate for the immense outlay occasioned by their construction, and which, of the many systems proposed, is the most preferable, has been much discussed of late in France. M. Telle has published a pamphlet with several plates, in which he dilates on the advantages resulting from a net of rails in the interior of Paris. He explains how by means of certain structures (*bâtisses*), rails could be laid even within the most popular districts. They would not impede the other ways of circulation, no losses would accrue to the general traffic, and goods and passengers could be conveyed to the door of almost every house. Lyons, Nantes, Angoulême, and other cities of France, possess already rails which pass through the very hearts of dense populations; but the topographical plans of these towns much favour such enterprises. M. Telle puts down the following as the chief advantages of his plan of internal railroads: 1. Division of the overcrowded traffic of populous localities. 2. Saving in the price of carriage of goods, cheapening of rents, &c. 3. Greater salubrity of districts thus pierced. 4. Possible regularization of single houses. 5. Extension of the areas of great towns. 6. Saving of time, facility of communication, business, &c. The means proposed by M. Telle are the laying down of a set of rails, or even of one single line passing through the great centres of traffic. He begins by the digging out of a cut (*tranchée*), either insulated, or between two rows of buildings. These two ranges of buildings, right and left of the rail, have another separate entrance in two streets, which run parallel with the railway line; and it is here where foot-passengers and the other general traffic may freely circulate. The rails are mostly to be laid level with the ground, but at times raised up to the height of a first story, wherever intervening roads, canals, &c., may make this necessary. M. Telle thinks, that the difference of price between old and worthless houses in crowded districts, and those which would arise on both sides of a spacious cut, would go far towards defraying the expenses of internal railways in large cities.

French Institute. Academy of Sciences. Meteorology.—The project of establishing a number of meteorological observatories in Algeria, brought on a discussion, of which the following is an outline. The commission were for observations every hour, as they are made at Greenwich; but M. Le Verrier said that this would be impossible. M. Regnault expressed his doubts, whether the noting of certain meteorological data was of any utility to agricultural science, and this is what government wanted to make prosper in Algeria. To the surprise of everybody, M. Biot, the Nestor of learned physicists, supported the opinion of M. Regnault. According to his argument, meteorology does not exist yet as a science. We do not know the strata of atmosphere in which the phenomena which we observe are really produced. On account of the little susceptibility of gas for heat, the changes in the temperature of the atmosphere can hardly be marked, the mobility of the stratum of air surrounding the earth being so great. M. Biot referred to the utter want of results which the numberless meteorological observations made in Russia have had on the agriculture of that country. Still, the desirability of establishing observatories in Algeria had a majority of votes.

New Scientific Instrument.—There have been constructed in San Francisco and San Diego, by order of the United States Government, "*Self-registering Flood-meters*," which accurately register the rising of the flood (*wafes*) in harbours, etc. During the great earthquake (Dec. 23rd, 1854) which destroyed at Simoda, in Japan, the Russian frigate *Diana*, the harbour became twice suddenly emptied and filled. In San Francisco, distant 7,800 miles from Simoda, the first colossal wave arrived in 12 hours 16 minutes, performing the traverse at the rate of 6½ miles per minute. The first impetus produced in San Francisco a rising of seven-tenths of a foot, which lasted half an hour.

[*Communicated by* Dr. J. Lotsky.]

HOW TO MAKE THE MOST OF LONDON BRIDGE.

To the Editor of the Mechanics' Magazine.

Sir,—That the population of London should, in the course of its perambulations, pedestrian, equestrian, and vehicular, prove somewhat too abundant for some of the old established thoroughfares, is a result which will not prove at all surprising to the readers of the *Mechanics' Magazine*, since I may fairly presume that your supporters are too philosophic to be ignorant of that fundamental principle in natural philosophy which teaches us that no two particles of matter can occupy the same place at the same time. Hence we find that, in hurrying over London-bridge from the train to the City, we are likely to miss our appointment, owing to the obstacles presented to our progress; and on our return we find ourselves in imminent risk of being belated for the train, owing to the fact that the crowd of the world's inhabitants on that granite bridge leaves us scarce room enough to elbow our way from one end to the other.

To remedy this state of things, and to obviate certain other associated evils, such as the blocking up of Union-street with cabs from the South-Western to the South-Eastern, and ditto from the South-Eastern to the South-Western, the first commissioner of public works is blandly smiling on the deputations from Surrey-side vestries and district boards, and urging them to wake up the Metropolitan Board of Works to the urgent necessity for providing suitable plans for the construction of a new and commodious street from the High-street, Borough, to Stamford-street, or the Waterloo-road. A sum of £80,000 and upwards is available for this purpose, and more is to be obtained by virtue of an Act of Parliament. Furthermore, to relieve the traffic on London-bridge, it has been proposed to the Metropolitan Board to negotiate for the opening of Waterloo and Southwark-bridges to the public free of toll. On this point we would just remark, that although Southwark-bridge would be of some extra service, if toll-free, it is much doubted whether it could safely bear a heavy traffic.

Mr. Pennethorne has proposed one or two plans for a new street. Mr. Pennethorne is of course a clever man. Other individuals have their plans for the same purpose, and these other individuals may or may not be clever men. For my own part, I have no plan for a new street; but still I have a plan in connection with this subject, a plan by which London-bridge could be made considerably more commodious at a very moderate expense. I don't contemplate an expenditure of £80,000, and therefore my plan may be called narrow-minded, imperfect, and pettifogging; but as it need not supersede any of the grand projects of other gentlemen for making new streets, I hope it will be allowed to stand upon its own merits, and will not be knocked upon the head before it has fairly got upon its legs.

And now—What is it? Why, it is just this: to tear up the existing pavements on London-bridge, and add their united widths to the roadway. The width of the approaches to the bridge is favourable to this proceeding. But what is to become of the pedestrians? They can be eligibly pro-

vided for by erecting on each side of the bridge a raised platform, having its inner edge resting on the existing parapet, and its outer edge supported by struts, girders, &c., fastened to the sides and abutments of the main structure. But how are the people to get on and off the said platforms? Why, just in this way. Let a portion of the parapet at each end of the bridge be removed, so that the platform may come down with a gentle curve to the level of the pavement. If the platforms are made in continuation of the main curve of the bridge, they will strike the pavement at just about the right point. But what is to become of the stairs that lead down to the water? About half their upper width might be granted for my proposed platforms, and yet the stairs would have a convenient width, while a spacious pathway would be afforded for the pedestrian public. Probably there are other ways in which this difficulty might be met, and I apprehend that no great opposition need be raised on this score. As for the fear of overloading the bridge, a system of struts or brackets, with horizontal girders, could be so applied to the support of the platforms, as to throw the weight upon the abutments, and not upon the crowns of the arches. I am not going to trouble you with any elaborate diagrams at present, but, should it be wished, I could show still further what I mean, by a few simple drawings.

The plan thus proposed, while almost equivalent to the construction of another road and footway bridge, would cost very much less, and would provide accomodation just where it is wanted. At the same time the necessary operations for the erection of the platforms need not obstruct the existing bridge for a single day. Nor need the construction of the platforms occupy a lengthened period of time.

Waiting to be shot at,

I remain, Sir, yours, &c.,

JOSEPH PITTER.

P.S. Of course the platforms should be railed on both sides.

254, High-street, Borough,
Southwark, May 5, 1856.

A SMOKE-REMOVING APPENDAGE FOR FURNACES.

To the Editor of the Mechanics' Magazine.

SIR,—The following plan for *filtrating* smoke—charged air, may not be considered intrusive on the space of your Magazine: I propose then, to have two water-tanks, to be placed some distance from the furnace; one on either side of the flue or chimney. Inside each of these tanks, I propose to place two wooden rollers, working loose on their centres. Two apertures are to be made in the wall of the flue or chimney opposite to each other, through which work two endless bands, or sheets of copper wire gauze (this gauze to be of the same width as the flue), which pass into the water-tanks, and round the wooden rollers, these rollers being properly arranged for the purpose. The topmost endless band must have a guide spindle placed near to the apertures of the funnel for keeping it in its proper position.

The bottom band must have a texture considerably more open than the upper one, in order to catch the larger and grosser portion of the smoke, and deposit it in the water-tank as it passes round the rollers. A brush in the tank will be found requisite, to clean the gauze in its revolution. The mesh of the upper one will catch the finer particles, which will go through the same process.

The gauze in passing round and through the water, will be kept clean, moist, and cool, which will not only hold the soot better, but will assist very materially in condensing and filtrating the air. Two endless bands, will, of course, be equivalent to four single filtrations, which may be quite enough in ordinary cases. If the number be increased, there must be a proportionate increase of draught.

I propose to use fanners for obtaining the requisite degree of current, and fix them above, or beyond the topmast band; so that the air will be drawn, not forced, through the gauze; these fanners will have a two-fold object of filtrating the air, and regulating the draught of the furnace. The fanners and rollers in the water-tank will be worked by a belt in connection with the engine. It will be seen that the tanks must be quite enclosed, to keep the smoke from escaping, and to improve the draught.

This plan is intended to do away with the nuisance of visible smoke, as this is the chief aim of manufacturers. The saving of 30 or 50 per cent. in the combustion of hydro-carburets, &c., is looked upon more as a bait for the adoption of certain plans than as an actually realised fact. Manufacturers do not require the rod of the magistrate to compel them to save 50 per cent. This arrangement will be comparatively inexpensive—neither "racks, pinions, hoppers, or revolving grates," will be required; and if it be desirable that the fuliginous fugitive gases should be caught and transmitted, I think it is within the range of human possibility to accomplish it. I have purposely kept out minor details, but if any gentleman wishes to try the plan, I will supply them on request.

I am, Sir, yours, &c.,

THOMAS ALMGILL.

Busby, near Glasgow, May 17, 1856.

WOODCOCK AND GARDNER'S PATENT FURNACES.

To the Editor of the Mechanics' Magazine.

SIR,—In your Number of May 24, Mr. C. Wye Williams has again favoured me with notice, and the subject is of such importance, that I venture to request from your readers a reference to that letter, in order to prevent quotations and to save your valuable space.

I could wish for Mr. Williams's sake, that he, in his various letters, had been less severe on the class which he terms "*re-inventors*," for most assuredly he comes under that description, his patent diffusion plate having been previously used, and also previously patented.

Watt well knew the value of causing the gases in the furnace to impinge upon the incandescent carbon, and Mr. Williams will have hard work to prove that Watt was in error.

Elsewhere Mr. Williams quotes Professor Graham, to the effect that "the carbonic acid produced in the lower part of the fire is converted into carbonic oxide as it passes up through the red-hot embers;" thus himself showing, that "the causing the gases and flame to impinge on the incandescent fuel is" *not* "altogether erroneous, chemically and practically," or, "contrary to all chemical knowledge," and that it is worth something more than "a thought." Or if not, is Mr. Williams prepared to affirm that there is no advantage in having a combustible gas present in the furnace in the place of an incombustible one?

Again; may I ask how often it is necessary to be repeated, that cold air should be given to the fire, in order to ensure the largest supply of oxygen in the least possible room, and hot air to the gases, in order to prevent their being cooled below their "flame points." "The conditions of combustion are" *not* "the same in both" cases. In the first instance, the gases have yet to be distilled from the fuel, and during the process they are surrounded by a mass of highly-heated coke or carbon, protecting them from excess of cold air. In the latter there is no such protection, and if their temperature by contact with the air is reduced below a certain point, they must be lost for all inflammatory purposes. The reference to "the gas in the Argand lamp" is not in point.

Will Mr. Williams's "dozen years" of experience explain the following fact as to the value of the impinging process? In large furnaces my inverted bridge is not calculated to do more than from six to twelve month's work, and in every case in which they have been replaced, it has been found that during the interval between the coming down of the old arch and its replacement by a new one, abundance of smoke, "popular" or "true,"* was given off from the shaft; and yet, the quantity of air admitted and all other circumstances were precisely the same. Will Mr. Williams still say, that this process is not worth "a thought"?

Had Mr. Williams, in correcting my previous remarks, used the words *imperfect* combustion instead of *non*-combustion, he would have properly corrected me; as it is, he has of necessity failed to show that there could be any products from *non*-combustion. I must r quest Mr. Williams to be more particula n his quotations. He has misquoted himself; for in his previous letter I do not find the words "*while in a state of flame;*" and the passage bears quite a different meaning as it stands in the original. *I did not misapprehend what was said.* Mr. Mansfield, when writing in defence of my views, was obliged to charge Mr. Williams with a similar error. I have far too high an opinion of Mr. Williams to think that these, and some similar cases, can be intentional. The supply of atmospheric air is given after contact with the incandescent fuel, in order that the carbonic acid generated in the furnace may be converted into carbonic oxide before that contact takes place; otherwise it would lead to no good result. This is my answer to the "gravest error of all." Mr. Williams will say that, had a sufficient supply of air been given at or above the fire-door, then the combustion would have been perfect in the furnace, and no smoke formed. I deny its practicability.

I apologize to Mr. Williams for again introducing his name in the same letter with that of Mr. Gardner's, but it has been unavoidable. To the letter of the latter gentleman in your last number I will not trouble myself to reply, beyond stating that a considerable portion, more particularly of the latter part of it, is quite unintelligible to me, and that I am prepared to place in your hands, Mr. Editor, proofs of the truth of every word I have written respecting Mr. Gardner or his furnaces. I am quite content with the position in which matters stand before your readers. As between myself and Mr. Gardner, the question at issue must be tried before another "tribunal;" and I leave the "PROFESSOR" to the enjoyment of any credit which he may suppose himself to have obtained.

I am, Sir, yours, &c.,
WILLIAM WOODCOCK.

12, Bishopsgate-street Within,
May 26, 1856.

---

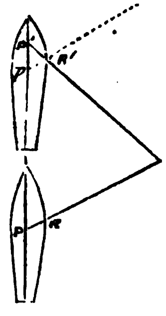
* "Popular smoke," I call any visible substance given off with the gases, of whatever nature; "True smoke," the discoloured results of imperfect flame.

MECHANICAL LOCOMOTION.

To the Editor of the Mechanics' Magazine.

SIR,—Having ceased to hold any further controversy with your correspondent "W.," because of his unfair mode of conducting it, I shall not reply to the additional misrepresentations he has been guilty of in his last communication, in attributing to me the really stupid notion that the point of application of the useful effect, or propelling force, is at the blade end of the oar, and not at the rowlock, although I neither asserted the one nor denied the other. The false imputation of what is simply erroneous is bearable, but really one cannot submit with equal patience to being made responsible for a foolish collocation of words. "W." makes me say, that "in a certain position of the hand of the rower, the exertion of *the strain* is useless;" but my words were, that in this case "the exertion of *power* is useless." The substitution of "strain" for "power" as evincing a confusion of ideas, in not discriminating between the active and passive meaning of words, may doubtless have been involuntary on the part of your correspondent; but I hope you, Sir, will be able to say—for quotations ought to be scrupulously correct—that there was a misprint in the case.

I have to apologise to your correspondent "C.," for having neglected him so much in this controversy; will you allow me, therefore, to present him, along with a few very brief remarks, the diagram I invited him to draw for himself, and which may be more satisfactory to many of your readers than a multiplicity of words. R is the



rowlock. This is the point which I have contended is the fulcrum of the propelling lever, meaning thereby, what in practical mechanics is always meant, the point, the measurement from which determines the ratio of the power to the resistance, or the ratio of the spaces which they respectively describe. It will be seen at a glance, that whilst "the work developed by the power" (a phrase on which I shall presently make some remarks*), is from p to P′, the work done in propelling the boat, is from R to R′. In order, however, to avoid the hyper-criticism to which I have been subject, I must carefully remark, that in "the work" so described, reference is made only to one of its factors, space, or the ignorance will be imputed to me of not knowing that it also consists of force.† This factor does not here admit so conveniently of graphic illustration as space. Now, the ratio of the spaces described by the power, and the useful effect, is as it ought to be, precisely that of the arms of the lever measured from R as the fulcrum; but there would be a discrepancy in this respect, if Q were taken as the fulcrum, unless the oar was handled from the outside of the boat, in which case, the ratio of the spaces described by the useful effect and the power, which latter would then be from P to P′, would be again the same as that which obtains between their respective portions of the lever as measured from Q. It will be seen also, that with R as the fulcrum, greater space is traversed at the expense of power, which is in accordance with the fact; but the contrary is the case, if Q be considered the fulcrum. Thus, the point R, in the boat, and not Q, in the water, is the true centre about which the moments are to be taken, and the equation adopting "W.'s" notation is, $Pa = Qb$. I must, however, protest against the application of the term moment in cases of this kind, when *work* is the only modification of power in question, unless the ideas of velocity and momentum are excluded from it; and certainly, they are not necessarily understood in the above symbolical expression, which is equivalent equally to the representation of work as the product of force and space, apart from any consideration of the time being given.

I am, Sir, yours, &c.,
B. CHEVERTON.

To the Editor of the Mechanics' Magazine.

SIR,—I regret to observe that Mr. Nichols, understanding your prohibition of lengthy letters on this question as a closing of the controversy, has brought his remarks in your Number of this day to a premature termination. I regret this on two ac-

* These we have had to suppress, at least for the present.—ED. M. M.

† It seems I show not "the slightest acquaintance with the term 'work' as measuring a certain effect of a force." By the bye, that fastidious correctness in the employment of words, a deficiency which (that I do not admit) is charitably imputed to me for ignorance, is itself violated in this very sentence, for pressure and not work is the effect of *force*, except in a free accommodated sense of the word force.

counts; one, that it would have been satisfactory—not so much on my account as that of your readers—to have the solution of this question by a gentleman who evidently knows something of the principles of mechanics; and another, because the termination of the controversy, by so unsound a letter as that of Mr. Rock, junior, would be most detrimental. On this account alone I resume my pen, with the intention of being as brief as possible. I quite agree with Mr. Nichols in his remarks on Mr. Rock's fundamental condition of continuous locomotion, and in his estimate of the value of that gentleman's explanation in general. Mr. Rock has been misled by Mr. Cheverton's illustration of a man propelling himself by a pole while sitting in a carriage. In this case the reaction of the ground on the rod is applied directly through the *rod* which is the medium also through which the sitter's muscular power acts; and so long as the pole is kept on the ground, the carriage has, of course, a velocity relative to the point of the pole in contact with it, which is absolutely fixed. The wheels of the carriage in this case are mere friction wheels. In the locomotive, motion is obtained by acting directly on one of the spokes of two or more of these very wheels, which at the same time do the duty of friction wheels, and of the medium of applying the motive power. The point of contact through which the reaction acts is not fixed, except *instantaneously*. The two cases, therefore, are by no means analogous. Mr. Rock's idea that the motive force can press against the axle of one pair of wheels, and against the crank-pin of another, involves a contradiction, and is simply a figment of his own brain. It is impossible for a power carried in a moving body to produce motion, except by its being applied to some part which has a power of motion relatively to the body. The ends of the cylinder being fixed, cannot communicate motion to any such moveable part—the piston-rod alone is capable of such an action. A man sitting in a carriage *could*, by a direct action on the spokes of one or more of the wheels, propel it in a manner similar to that of the locomotive engine; and this is the only fair comparison that can be instituted between a man sitting in a carriage propelling it, and a locomotive propelling a train. The case of a rower propelling a boat by means of an oar is analogous to that of a man sitting in a carriage, and driving it by means of a rod; but is very different from that of the locomotive. That this is so, Mr. Rock and "C." might easily convince themselves by the reflection that useful work is done by the piston-rod of the locomotive, both in its forward and backward stroke; while if a rower attempted to work with his oar in the back-stroke, it would undo all that he had just before done in moving his boat forward, or at the very best only "catch a crab." One thing is very evident to me—that in the attempt to solve questions of locomotion without due regard to the laws of mechanics—by the light of nature and false analogies—it is very easy to catch a Tartar. I am sorry that I have done "C." an injustice by classing him among "practical men," and I hereby make an apology to him for doing him so grievous a wrong. I cannot, however, follow him through his several remarks; but must request your readers to observe that what I have said above is a virtual reply to him.

I am, Sir, yours, &c., W.

To the Editor of the Mechanics' Magazine.

SIR,—It seems that my letter upon "Mechanical Locomotion" has started quite another question than that which gave rise to the discussion. It would have been well to have got the first question settled first, but I cannot consent to be extinguished as Mr. Nichols would have me be, because he happens to see as far into my "drum" as ordinary mortals do into a millstone; and so I must ask your permission to say a word or two in support of my assertion, That continuous locomotion necessitates a point of support for the machine, besides that by means of which its locomotion is effected.

First, a word to "C," whom I thank for his courtesy. The apparent contradiction which he has pointed out is *only* apparent. The two cases of propulsion—the one with the crank-pin below the centre, the other with the crank-pin above the centre—are totally different, and the relation of the axle to the wheel at the moment of impulse varies accordingly. In the first case, it is the axle of the fore-wheels which is referred to; in the second case it is the axle of the driving wheels. I can put "C" into the way of verifying my explanation as I have done by experiment, if he wishes it.

"C.'s" conception that "the front" of the engine may "reach down to the smooth rails and slide along upon them," is only the substitution of a sliding support for a rolling one. There are still two points of support upon that showing.

And now for Mr. Nichols and the "drum." If Mr. N.'s investigation had penetrated to the interior of the drum, he would have seen that the locomotive engine was using it merely as a portable railroad. At the moment of locomotion the engine rests upon two points within the drum—one at or near the centre where the drum rests upon the

earth, the other at such distance from the centre as may suffice to enable the weight of the engine to overcome the inertia of the drum and the resistance opposed by the roughness of the ground to its motion. Virtually, the drum is a part of the road, and not a part of the engine.

So, again, with a case of locomotion which appears even more opposed to my views than the one just disposed of, viz., that of the boy at Astley's who propels a ball with his feet while standing upon it. The ball rests upon a single point on the ground, even more distinctly than the drum; but the propelling engine—the boy—has two points of support nevertheless, namely, his two feet. The ball is not a part of the boy, but is analogous to a rolling stone upon the road; it is, in fact, the road upon which the boy travels, and any engine working similarly to the boy would fulfil similar conditions.

I will go farther even than this, and say that if the boy referred to could manage to travel upon the ball by means of one foot, which is just possible, he would still have two points of support by which to effect locomotion, namely, the toes and heel of the foot.

I can find no case of mechanical locomotion that does not, when strictly analysed, fulfil the condition which I have called fundamental. Those who doubt it may study to find how much continuous locomotion they can get out of an engine resting through a single perfectly hard point upon a perfectly hard surface. I commend this especially to Mr. Nichols' consideration, before he begins his model of a locomotive steam engine for running *down hill*.

I am, Sir, yours, &c.,

JAMES ROCK, JUN.

Hastings, May 26, 1856.

P.S. In my former letter your printer made me speak of "laws enumerated," instead of "law enunciated." In that letter I omitted to insert the qualifying remark that my explanation of the action of the locomotive engine only went to the extent of showing the action of one cylinder of the two which the engine possesses. It would have complicated the discussion to have taken the combined action of the two cylinders into consideration, one cylinder being sufficient to establish a case of continuous locomotion.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

NEWTON, W. E. *Improved machinery for dressing flour.* (A communication.) Patent dated October 10, 1855. (No. 2264.)

One of the improvements consists in connecting the bolting cylinder as directly as possible to the mill spindle, and in introducing the elevators between the bolting cylinder and the millstones, supplying the material to be operated upon at that end of the rolling cylinder farthest from the millstones, and arranging the conveyors above and below the bolting cylinder, and parallel to each other, or nearly so. The flour is subjected to considerable cooling influence in its passage up the elevators, and particularly through the trough and conveyor which conduct it to the bolting cylinder.

ODDIE, T., W. LANCASTER, and J. LANCASTER. *Certain improvements in looms for weaving.* Patent dated October 10, 1855. (No. 2266.)

The first part of this invention relates to an improved picker of that class which works on a spindle. The second part relates to the taking-up motion, and consists in combining with a series of wheels employed for this purpose a lever of the second order, actuated from the slay sword, that is, a lever having the taking-up catch attached to it on the same side of its fulcrum as the actuating power is applied. The third part consists in the employment of a compensating roller or bar, which is placed transversely upon the yarns between the back bearer or yarn carrier and the healds, and it is free to rise and fall in a slotted bracket or guide placed at each end, as the shed opens and closes.

THORNTON, J., A. THORNTON, W. THORNTON, and H. THORNTON. *Improvements in machinery for the manufacture of looped or knitted fabrics.* Patent dated October 10, 1855. (No. 2267.)

This invention consists of a combination of parts into a machine in which two cylinders are used, each grooved on its circumference with as many grooves as there are needles or looping instruments. These cylinders are caused to revolve simultaneously end to end, but a short distance apart, so as to admit of the needles or looping instruments being slid from the grooves of one cylinder into those of the other. In these grooves are slid needles or hooked instruments, each having a hook at each end, so that the work is alternately made at the two ends of the needles or looping instruments, which are slid to and fro, from cylinder to cylinder, by means of fixed inclines or guides, the work being forced over the heads of the needles or looping instruments when they are moved into the grooves.

HÉBERT, D. *Improvements in heating and arranging ovens.* (A communication.) Patent dated October 10, 1855. (No. 2268.)

Claim.—The combining of a baking oven with a steam boiler, in such manner that the oven is heated by the flame and heated

gases which escape from the flues of the steam-boiler furnace. Also, the causing of a jet of steam to play over the surface of the bread while baking.

FAIRBAIRN, W. A., and G. HASLEM. *Improvements applicable to locomotive engines and carriages.* Patent dated October 11, 1855. (No. 2273.)

A description of this invention is given on page 489 of our last Number.

BAILEY, W., and J. QUARMBY. *Improvements in machines for carding cotton and other fibrous materials.* Patent dated October 11, 1855. (No. 2274.)

This invention relates to carding engines in which flats are employed, and to arrangements of mechanism for stripping such flats; it consists mainly in causing a stripper card, equal in length to the flats, to pass under them, each flat being slided up its pins, to allow the stripper card to pass and act on the under side of it, by inclines or other suitable means which raise and lower the flats in succession. The stripper card has the backward and forward motion given to it by endless chains or bands passing round revolving pulleys, and it may be stripped by being made to come in contact with a reciprocating comb, or with a revolving brush or card roller, stripped or doffed by a reciprocating comb.

SPENCE, P. *Improvements in the production of sulphate of alumina to be used in the fluid state, or to be rendered into the solid condition, known commercially as cake alum.* Patent dated October 11, 1855. (No. 2275.)

The inventor takes China clay, breaks it into pieces about the size of beans, places it in a false bottom in a vessel lined with lead, and set over a fire-place, and covers it for twenty-four hours with water impregnated with sulphurous acid gas and mixed with 1 per cent. of sulphuric acid, and thus dissolves the iron from it. He now runs off the liquid, and covers the material with pure water, which after five or six hours is also run off. He then adds sulphuric acid diluted until it stands at 80 of Twaddle's hydrometer 1·4 specific gravity; heat is then applied, and the liquid brought up to at least 240° Fahr., and kept at that until the sulphuric acid is saturated with alumina; viz., from thirty-six to forty-eight hours. The solution is then run off into stone or leaden coolers, as in the ordinary manufacture of sulphate of alumina, and concretes into the solid body.

WESTROP, J. K., and E. A. SHARMAN. *An improvement in the manufacture of gloves made of looped fabrics of silk, cotton, and linen.* Patent dated October 11, 1855. (No. 2277.)

This invention consists in affixing to each glove a leather band at the wrist, with a button and button-hole, or means of connecting the ends of the leather band, by which a glove of looped fabric will be better held in shape when on the hand than by elastic wristbands.

TILGHMAN, R. A. *Improvements in treating fatty and oily substances.* Patent dated October 11, 1855. (No. 2278.)

This invention consists of a method of hardening fatty and oily bodies (either fat acids or neutral fats), by subjecting them to the action of a small proportion of sulphur or of phosphorus at a high temperature.

KAY, R. H., A. T. RICHARDSON, and G. MALLINSON. *Improvements in the manufacture of plain and ornamental woven fabrics.* Patent dated October 12, 1855. (No. 2281.)

This invention consists in producing piled fabrics, the surfaces of which are either corded or plain. The weft threads are floated over the warp threads, and the races thus formed are cut to produce the pile. By floating the weft over a sufficient number of warp threads, and by employing weft of suitable materials and colours, the fabrics may be made to resemble when cut and finished the furs of animals, the feathers of birds, &c.

MOORE, T. *An improved mill for grinding corn and other grain.* Patent dated October 12, 1855. (No. 2282.)

This invention consists in combining in one mill steel and stone grinding surfaces. The first and upper grinding surface is formed of a vertical steel cone which revolves in a corresponding fixed cone, and below these cones ordinary grinding stones are fitted horizontally. The grain is fed between the steel cones from a hopper, and in its passage through them becomes very quickly bruised and converted into meal, which then falls between the horizontal grindstones which reduce it to flour.

LYALL, W. *Improvements in spinning machinery, applicable also to roving machinery.* Patent dated October 12, 1855. (No. 2283.)

This invention consists in the adaptation to spinning and roving machinery of an oil-tight trough or case, fitted with branches or supports for receiving the feet or pivots of the spindles, and with a tilting lever, or other suitable contrivance for throwing or depositing the oil upon the gear and the pivots contained also within the trough, for the purpose of keeping the gear as well as the pivots constantly lubricated. The object of this arrangement is to keep the oil or other lubricating material free from dust, so that the same material may be used over and over again, and also to prevent the oil or other such material from being scattered over the other parts of the machine.

COCKINGS, J. S., and F. POTTS. *Certain*

improvements in sockets for whips and candles, parts of which are also applicable to the sockets or irons for holding carriage and other lamps. Patent dated October 13, 1855. (No. 2288.)

These improvements consist—1. As regards whip sockets, in the manner of making expanding and contracting linings or rings of India-rubber or gutta percha, to counteract the shaking action of the carriage to the whip handle; also in the use of a metallic plate, as a means of uniting leather whip-sockets, &c. 2. As regards sockets for holding candles, in the application of a side screw and plate for increasing or diminishing the space for holding the candle for the purpose of adapting the socket to the various sized candles, &c. 3. As regards sockets for holding carriage lamps, in making them in such a way that a contracting lining may be readily fitted to them; also to a mode of making irons for holding carriage lamp sockets.

GREAVES, H. *Improvements in the construction of steam boilers.* Patent dated October 13, 1855. (No. 2289.)

This invention relates principally to boilers adapted to locomotives. The patentee connects the fire-box to the tube plate, by means of a pipe or pipes, with the inside of the roof or crown of the inner shell of the fire-box; and in some cases he applies similar pipes on all sides of the fire-box, so as to allow of still better circulation. He likewise connects by a pipe that part of the water space which is below the fire-door to the part above the door. The circulating pipes he makes of cast malleable iron, in preference to other metals. He also employs a conical tubular column or tubes passing through the fire, suspended from the crown or cover of the inside of the fire-box, and provided with a blow-off cock at the bottom, and a circulating tube inside the said pipe, &c.

THIBIERGE, G. A. *Certain improvements in manufacturing chlorine, part of which are applicable for obtaining certain accessory products.* Patent dated October 13, 1855. (No. 2290.)

The patentee manufactures chlorine without employing the peroxide of manganese, and obtains hydrogen and oxide of iron as accessory or secondary products. He passes hydrochloric or muriatic acid gas over iron at a high temperature, and thus obtains proto-chloride of iron and hydrogen gas. He passes common air over the proto-chloride of iron at a high temperature, and thus obtains peroxide of iron and chlorine gas.

DEWRANCE, J. *An improvement in the frames of pianofortes.* Patent dated October 13, 1855. (No. 2291.)

This improvement consists in a mode of constructing the framing of these instruments of cast iron. In practice, the T-shaped bar has been found to answer the purpose, and this form is preferred. For receiving the pins on which the strings are secured, the patentee employs a piece of hard wood, secured by means of bolts, and let into a recess in the metal frame.

ULLRICH, L. *Improvements in the means of indicating the number of persons entering an omnibus or other carriage, any theatre, or other building.* Patent dated October 13, 1855. (No. 2293.)

The inventor describes an apparatus composed of a bell-crank lever, a train of wheel work, &c., and attached to the floor of a carriage or building.

HEMSLEY, T. and W. *An improvement in the manufacture of embossed and craped fabrics.* Patent dated October 13, 1855. (No. 2295.)

The object of this invention is to obtain greater elasticity in embossed and craped fabrics by applying looped fabrics made of warps or longitudinal threads looped into each other. The patentees prefer to use warp fabrics, the warp threads of which, in addition to looping into each other, also traverse from selvage to selvage; but it is not essential that the warp threads should so traverse.

BOUSFIELD, G. T. *Improvements in power looms.* (A communication.) Patent dated October 13, 1855. (No. 2296.)

A part of these improvements relates to driving, stopping, and arresting the motion of power looms, and consists in the employment of friction cones for driving, when the said friction cones are combined with a brake for arresting the motion of the loom when thrown out of gear; also, in constructing the belt cone so that it may be conveniently oiled when the belt is in motion. Another part relates to the delivery of the warps, and consists in a mode of constructing and arranging the tension roller, and of applying the brake thereto, for driving said tension roller, when the lathe beats up, and also in connecting the tension roller with the let-off motion.

LOZANO, M. P. *Improvements in treating pyrites and ores containing sulphur, in obtaining sulphuretted hydrogen and in precipitating copper from solutions.* (A communication.) Patent dated October 13, 1855. (No. 2297.)

This invention applies to the extraction of sulphur from such minerals, by means of an apparatus of peculiar construction (which cannot be well described without drawings), which allows of the application of the direct flame of a gas furnace for the evaporation of the sulphur.

BOUSFIELD, G. T. *Improvements in looms suitable for weaving wire fabrics.* (A communication.) Patent dated October 13, 1855. (No. 2298.)

In the improved loom the shuttle is handed through the shed of wire warps by means of arms, one on either side of the loom, which simultaneously move towards and from the centre of the web, one arm carrying the shuttle into the shed until it meets the other arm, which takes it to the side of the loom opposite from whence it started, the motion of the shuttle alternating first in one direction and then in the other.

STENHOUSE, J. *Improvements in the preparation of decolorising materials.* Patent dated October 13, 1855. (No. 2299.)

This invention is for rendering vegetable charcoal available as a decolorising agent, by introducing certain substances, such as oxide of iron, alumina, or phosphate of lime, in solution into the mass of vegetable charcoal, and then rendering these substances insoluble within the pores of the charcoal. The charcoal is heated with the solution of these substances till the air contained in its pores is expelled, and the charcoal saturated with the solution. It is then dried and heated to redness in close vessels, till the water and acid contained are expelled. Vegetable charcoal so treated may be used for decolorising syrups and other coloured solutions.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GEDGE, J. *Improvements in machinery or apparatus for placing on card drawings used in various manufactories.* (A communication.) Application dated October 10, 1855. (No. 2261.)

The inventor proposes to effect the placing on card the drawings used in various fabrics by an apparatus carrying the lamps, object glass, and reflectors, and sketch, which slides up and down pillars by means of chains and counter weights enclosed therein, and worked by a handle behind. Beneath this apparatus is placed a table for the artist, who draws a curtain entirely round him.

FAIRBAIRN, T., W. A. FAIRBAIRN, and G. FAIRBAIRN. *Improvements in the mode or method of casting ordnance, which improvements are also applicable to casting cylinders and other similar vessels.* Application dated October 10, 1855. (No. 2262.)

These improvements consist in the use of hollow mandrils of metal or other substance, instead of cores, to form the internal surfaces of the chambers of ordnance, as also of cylinders or other similar vessels, such mandrils being formed accurately to the shapes of the surfaces required in the castings, whereby subsequent turning, boring, or fitting is avoided. The mandrils are kept in shape, and rendered capable of extraction from the casting, by means of water, air, or other suitable contrivance.

PYNE, R. W., and W. MALAM. *An improvement in the manufacture of gas.* Application dated October 10, 1855. (No. 2263.)

This invention consists in producing gas from dead oil, fat, and fatty and oily substances generally, by passing the same gradually into a chamber containing in the centre coke or other similar filtering medium, and separated into three compartments by two iron plates, which dip below the surface of the coke. A supply is introduced through a suitable pipe in drops or small streams into one compartment of the chamber, where they become decomposed, and the gas given off passes through the coke, and enters the last compartment, from which it finds it exit through a discharge pipe made to dip into water in a tight box, whence it is carried off into a receiver from which it is supplied for lighting, &c.

PARRY, J., and S. IVERS. *Certain improvements in looms for weaving.* Application dated October 10, 1855. (No. 2265.)

This invention applies to a method of stopping the loom, and consists in the employment of a light metal bar, supported by brackets, and carrying at convenient distances a series of small bent metal fingers, working loosely on the bar, the ends of these fingers being lightly retained upon the surface of the fabric under manufacture by suitable springs. To this bar is imparted a lateral motion, so that should a thread break, the nearest finger (and therefore the bar) becomes checked in its lateral traverse, by the finger partially falling through the fabric, and being there retained. At one end of the bar, and near the ordinary "throwing out" motion, two small pins embrace and cause a small lever to follow the traverse of the bar: this lever is supported by a vertical rod, having at its lower end a catch box, to which a reciprocating motion is given, it being connected by a small slotted lever at one end to a rod secured at its other end to a pin revolving on a worm wheel, working horizontally, and actuated by a worm upon the "tappet shaft." When a "float" takes place, the nearest "finger" falls through the fabric, or is checked in its traverse (and with it the traversing bar). The vertical rod is now lifted by the teeth or ratchets of the catch box, the small lever on the top of the vertical rod is forced up, and lifts an arm secured at one end on the throwing out or "stop motion." This arm comes into contact with a plate on the advancing "slay," and immediately forces back the

arm and throwing out or "stop" motion, and stops the loom.

TAYLOR, W. C. *Improvements in marine steam engines.* Application dated October 10, 1855. (No. 2269.)

The object of this invention is, that the parts may be conveniently arranged, and occupy little space. There are two piston rods, to one of which the piston of the air-pump is affixed, and the other works the hot-water pump. These pumps are placed within the condenser. The piston rods are connected by a cross head which gives motion to the crank of the propeller shaft.

REINAGLE, R. R. *Improvements in barrows, hand-trucks, and other similar vehicles.* Application dated October 11, 1855. (No. 2270.)

These improvements mainly consist in inclining the front and sides of the vehicles to meet in the centre of the axle of the wheels, by placing the axle to the rear of the centre of the floor, and by extending the arms considerably beyond the length of those now in use.

GILPIN, J. *An improved "raising gig" to be employed in the manufacture of woollen cloths.* Application dated October 11, 1855. (No. 2272.)

This invention is designed to enable the well-known operations of the "raising gig" to be carried on in two or more places of a piece of woollen cloth at one time; across the face of the teasling drum of an ordinary "gig-mill" the inventor arranges the "raising gig" and its connecting parts as follows: he employs, for example, two breast rollers, one at each side of the centre of the drum, and immediately over that centre he places a guide roller over which the cloth passes from the feeding roller over the breast rollers on to the winding on roller, the cloth being kept in a proper state of tension, and the breast rollers raised or lowered, by an arrangement of worm and worm wheels in connexion with a shaft. An important feature consists in the use of certain mechanism for effecting the reversing of the direction of motion of the teasling cylinder and feeding and winding on rollers when it is required to subject the cloth to a second teasling.

ADAMS, W. B. *Improvements in machinery and tools for cutting and carving wood and other materials.* Application dated October 11, 1855. (No. 2276.)

This invention consists mainly in modes of cutting wood or other materials into irregular forms by means of vertical or horizontal revolving cutters, worked by steam or other power, the form of cutter being determined by a dumb or non-cutting tracer, moving over the surface of a model, similar to the method used in the pentagraph.

CLARK, J. *Cooking apparatus for the pocket.* Application dated October 12, 1855. (No. 2279.)

This invention consists in combining a drinking cup, spirit case, coffee strainer, &c., with a metal case, which may be used for cooking soup, &c., or heating water, &c., or there may be two such cases one within the other.

PULS, F. *Improvements in electro-coating metals or alloys of metals with other metals or alloys of metals.* Application dated October 12, 1855. (No. 2280.)

The inventor constructs galvanic batteries, in which the positive plates consist of the metals or alloys with which the articles are to be coated. He employs for exciting fluids such acids or mixtures of acids in a diluted state as may be found suitable in each instance to the metals operated on, and he places the batteries thus formed in a suitable trough, in conjunction with the articles to be coated, and so adjusted that the solutions of metals or alloys obtained from the positive plates can freely pass to the articles to be coated, and thereon deposit the said substances.

WARD, C. *Improvements in the construction of the musical instruments designated clarionets.* Application dated October 12, 1855. (No. 2284.)

In the ordinary clarionet difficulties exist in the execution of the scales and intervals of the notes, owing to the inconvenient manner in which the performer is confined by its construction to produce the first, second, third, and fourth, and the twentieth, twenty-first, twenty-second, twenty-third, combined with the fifth and twenty-fourth notes, these two series of notes being dependent upon the same keys and apertures of the clarionet. The inventor describes certain arrangements intended to enable the performer to produce these notes with greater facility and certainty when either of them are used in relation to each other, or to any other of the notes in the scales, without disturbing the common fingering and position of the ordinary clarionet.

GARDNER, H. *Improvements in machinery for dressing or cleaning wheat, grain, and seeds.* Application dated October 12, 1855. (No. 2285.)

In this invention the wheat is dropped in a shower from a winnowing machine, or otherwise, on to an endless web caused to move continuously in an inclined position; the lighter and refuse matters are carried by the web in one direction, whilst the good wheat by its weight descends in an opposite direction, and is thus separated in a dressed or cleaned state.

LIVINGSTON, J. *Improvements in certain parts of the permanent way of railways.* Application dated October 12, 1855. (No. 2286.)

These improvements are designed for dispensing with the use of switches or points, as heretofore constructed, and consist in the use of a pair of sliding rails. An important feature consists in rendering the sliding rails self-acting, which is effected by the use of two check rails, securely fixed to the chairs or sleepers, or to both of them.

STAADT, A. *Improvements in obtaining motive power when gravity and steam or expansive fluids are used.* (Partly a communication.) Application dated October 12, 1855. (No. 2287.)

Two or more cylinders are fixed to a suitable axis. In each cylinder is a weighted piston, and the steam is alternately admitted to the two ends of the cylinders, so as to lift the pistons from below the axis of motion to the ends which, for the time, are uppermost, in order that the pistons may, as the cylinders pass the vertical position, be at the highest parts of the cylinders, and by gravity cause the upper ends of the cylinders to descend to the lowest position, by which means a constant rotatory motion is obtained.

EAVESTAFF, W. G. *Improvements in the construction of pianofortes.* Application dated October 13, 1855. (No 2292.)

This invention relates to the action of piano-fortes, and consist in dispensing with certain of the centres usually required, and in lieu thereof communicating the motion or action of the key to the hammer in a direct manner, and in adapting to this part of the action guide pins for directing the acting parts. To the upper part of the action is adapted an improved escapement, and a stop or check action, in lieu of the complicated contrivances usually employed. The stop or check action consists in adapting to the upper or hammer part of the action a curved or inclined piece, placed so that when the hammer has struck the string, and rebounded as usual, it is caught and retained from striking again until the key is again depressed. The escapement is adapted direct to the conducting rod, without employing any other centre or hinge between the key and the butt of the hammer than that required for the escapement itself. Another improvement relates to the bridge, and consists in adapting thereto a clip under which the string is passed, and thus is firmly held at the point where the vibration commences.

MOSELEY, J. *Certain improvements in machinery for cleansing linen and other fibrous materials.* Application dated October 13, 1855. (No. 2294.)

The improved machine consists of an iron vessel, supported by a suitable framing, and contains heated water. At each end of the vessel are fitted rollers, round which an endless band or belt of canvas travels. By this means the clothes, when put in at one end of the machine, are carried through and delivered at the other. In their passage they pass over two rollers, above which are fitted a series of beaters or stampers alternately raised by a wheel, having radial arms projecting from its periphery. The surfaces are covered with vulcanized India-rubber, for preventing injury to the clothes. After they have passed under the beaters or stampers, they are further acted upon by a series of rollers. At the delivery end of the machine are two rollers, between which they next pass, and thereby have the water pressed out of them.

LEFTWICH, C. *Improvements in water-closets.* Application dated October 15, 1855. (No. 2300.)

These improvements consist in so constructing water-closets that the valve shall be raised in the basin (instead of being drawn downwards) by means of a segment arm connecting the valve with a radius arm moving on the centre, and under the command of a lever fixed in the seat.

PROVISIONAL PROTECTIONS.

Dated April 4, 1856.

820. Joseph Gilbert Martien, of Newark, New Jersey. Improvements in the manufacture of iron.

Dated April 24, 1856.

980. Alexander Southwood Stocker, of Poultry, London, manufacturer. Improvements in the application of certain materials to the manufacture of ink and other stands, and other articles, and in the manufacture and finishing of articles produced out of such or other material or materials.

Dated April 25, 1856.

992. George Elliot, of Newcastle-on-Tyne, and William Watson Pattinson, of Newcastle-on-Tyne. Improvements in the production of peroxide of manganese.

Dated May 7, 1856.

1069. John Furnevall, of Haslingden, Lancaster, iron founder. Certain improvements in the construction of valves.

1070. George Martin, of Windmill-terrace, Camberwell, and Alfred Lodwick Newman, of New Church-street, Bermondsey. Improvements in freeing or purifying animal fibres from admixture with vegetable matters.

1071. William Joseph Curtis, of Sebbon-street, Islington, civil engineer. Improvements in carriages to run on rail or tramways and common roads.

1072. Ralph Heaton the younger, Harry Heaton, and George Heaton, of Birmingham, Warwick, manufacturers and co-partners. A new or improved manufacture of balance weights used for counterbalancing pendant lamps and chandeliers, and for other like purposes.

1073. Samuel Alexander Bell and John Black, of Bow-lane, London, vesta light and match manufacturers. An improved method of, and preparation for, igniting matches.

1074. Jean Périnaud, dyer, of Paris. Certain improvements in preparing or dressing silks.

1075. Robert Royds, of Southampton, Hants, engineer. An improvement or improvements in the manufacture of soap.

Dated May 8, 1856.

1076. Louis Guillaume Perreaux, of Rue M. le Prince, Paris, France, engineer. An improved valve.

1077. Charles Schneider and Frederick Leiss, of Hesse Darmstadt, Germany. Manufacturing a safety boiling apparatus.

1078. Louis Fréderic Mayer, of Regent-street, Middlesex. Improvements in photography.

1079. Alexander Ebenezer Riddle, of Walbrook, City, and Isaac Hoare Boyd, of Mansion-house-place, City. The improvements in tanning by machinery and chemicals. A communication from G. F. Kendall.

1080. James Niven, of Keir, Perth, N.B., gentleman. Improvements in the manufacture of paper, and in the production of textile materials.

1081. James Gray Lawrie, of Glasgow. Improvements in steam engines.

1082. Jonathan Amory, of Boston, United States. Improvements in furnaces for locomotive and other steam boilers, which improvements are applicable to reverberatory and puddling furnaces, and to furnaces for heating buildings.

1083. Conrad William Finzel, of Bristol, sugar refiner, William Needham, of Smallbury-green, Middlesex, manufacturer, and John Barton, of Shoe-lane, London, engineer. Improvements in apparatus for filtering sugar and saccharine juices.

1084. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in machinery for felting or sizing hat bodies. A communication.

1086. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery for cutting, punching, and forging, or swaging nuts or washers. A communication.

1087. Alexander Charles Louis Devaux, of King William-street, London, merchant. Improvements in the construction of granaries.

1088. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved construction of rotary pump. A communication.

1089. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improvement in bands for securing bales of goods, and for other like uses. A communication.

1090. Stephen Walter Underhill, Wellfield Cottage, Dunse, Berwickshire. The preservation of life in cases of shipwreck or other casualty at sea, the Buoyant Cushion.

Dated May 9, 1856.

1091. Léon Louis Jardin and Joseph Blamond, of Rue de l'Echiquier, Paris, engravers. Certain improvements in engraving on stone, earthenware, china, and glass, and also in ornamenting the same.

1092. William Bayliss, of the firm of W. and M. Bayliss and Company, flat and round chain manufacturers, of Wolverhampton, Stafford. Improvements in chains for collieries, cables, and other purposes.

1093. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in carding engines for carding cotton and other fibrous materials. A communication from G. Wellman, of Lowell, United States.

1094. John Wesley Hackworth, of Priestgate Engine-works, Darlington, Durham, engineer. Improvements in machinery or apparatus for raising and lowering heavy bodies.

1095. Ferdinand Potts, tube manufacturer, of Birmingham, Warwick, and Thomas Vann, wire-worker, of Cheapside, Birmingham. Certain machinery for ornamenting, floating, burnishing, and polishing metallic tubes, part of which machinery is also applicable for performing the like operation upon other metallic surfaces.

1096. Edward Daniel Johnson, of Wilmington-square, Middlesex, watchmaker. An improved mode of mounting marine chronometers.

1097. George Jordan Firmin, of Newton-le-Willows, Lancashire, manufacturing chemist. Improvements in the manufacture of sulphuric, tartaric, citric, and oxalic acids, ammonia, and cyanides.

1099. William Basford, of Talbot-road, Kentish-town, Middlesex, engineer. Improvements in apparatus for purifying coal gas.

1100. Louis Beauché, of Offenbach, near Frankfort-on-the-Maine. A machine for the manufacture of cigars.

1101. George Simpson, of Leather-lane, London. Improvements in rotary knife-cleaning machines.

1102. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. An improvement in cranes. A communication from Camille R. Neustadt.

1103. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in machinery for the manufacture or finishing of tyres, hoops, and rings. A communication from A. Duboy, of Givors.

Dated May 10, 1856.

1105. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in machinery for manufacturing tubes and pipes, applicable also to the rolling of rods and bars. A communication.

1107. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for cutting irregular forms. A communication from Henry D. Stover and James W. Bicknell, of Boston, United States.

1108. James Wallace, jun., of Glasgow, Lanark, N.B., manufacturer. Improvements in preparing, bleaching, washing, cleansing, and drying textile fabrics and materials and pulpy substances.

1109. Robert Wotherspoon, of Glasgow, Lanark, N. B., hat manufacturer. Improvements in hats and other coverings for the head.

1110. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in drying leather and dressed skins. A communication from Messieurs Arthus Brothers, of Paris, France, tanners.

1111. John Ridal, of Sheffield, York, working cutler. Improvements in spring knife handles.

1112. William Burkin, of Neate-street, Old Kent-road, floor-cloth maker. Improved machinery for manufacturing painted cloths.

1113. Bartholomew Beniowski, of Bow-street, Covent-garden, Middlesex, Esq. Improvements in typographical composition, and in the manufacture of logotypes to be used therein.

Dated May 12, 1856.

1114. Charles Frederick Claus, of Latchford, Chester, practical chemist. Moistening land, streets, and the better extinction of fires.

1115. Pierre Ernest Aimont, manufacturer, of Paris. Certain improvements in manufacturing shoes and other coverings for the foot.

1116. Richard Whytock, of Edinburgh. Improvements in apparatus to facilitate the printing of yarns or threads.

1117. Edouard Besnier de la Pontonerie, of Paris, France, merchant. Certain improvements in the apparatus for consuming smoke. A communication.

1118. Barnett Samuel, of Sheffield, York. Improvements in the manufacture of combs.

1119. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Certain improvements in machinery for pumping and forcing water and other fluids. A communication from G. Denison, United States.

1120. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery for splitting or cutting blocks of wood for match splints, kindling wood, trenails, and other purposes. A communication.

Dated May 13, 1856.

1121. Charles Butler Clough, of Llwyn Offa, Flint, Esq. Improvements in elongating and contracting metal bars or rods for the obtainment of motive power.

1125. Alexander Parkes, of Birmingham. An improvement in preparing materials for and in waterproofing and coating woven and other fabrics, paper, leather, and other substances.

1127. Robert Raywood, of Penistone, York, stone dealer. Improvements in railways.

1129. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery for removing snow from railroad tracks. A communication.

Dated May 14, 1856.

1131. Henry Bragg, the younger, of Belfast, Antrim, Ireland, commission agent. Improvements in machinery or apparatus for finishing linen and other fabrics.

1133. Hiram Groves, of New York, United States, surveyor and lithographer. Improvements in tune barrels or cylinders, or other apparatus for playing upon organs or other musical instruments.

1137. Alexandre Tolhausen, of Duke-street, Adelphi, Middlesex, sworn interpreter at the Imperial Court of Paris. An improved distance indicator for public carriages. A communication from C. A. L. Mannory, of Berlin.

1141. Charles Henry Olivier, of Finsbury-square, Middlesex, commission merchant. Improvements in the mode of preparing and applying silk waste. A communication.

1143. William Crofts, of Derby-terrace, Nottingham-park, manufacturer. Improvements in the manufacture of lace and other weavings.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," May 27th,* 1856.)

89. Alexander Bain. Improvements in the construction of inkstands.

94. Richard Kemsley Day. Improvements in the manufacture of fuel.

111. Thomas Dunn. Improvements in boilers and apparatus for heating water and generating steam.

112. Henry M'Evoy. Improvements in locks, latches, and staples.

123. Peter Armand Lecomte de Fontainemoreau. An improved apparatus for the prevention of accidents or collisions on railways. A communication.

131. John Platt and John Whitaker. Improvements in machinery or apparatus for doubling or twining yarns or threads, parts of which improvements are also applicable to mules for spinning.

133. Guiseppe Antonio Tremischini. Improvements in electro-telegraphic communications.

157. John Coope Haddan. Improvements in omnibuses and other similar carriages.

176. Alexandre Tolhausen. An improved manufacture of yarn from wool or other felting material. A communication.

177. Alexandre Tolhausen. An improved lock-joint for the rails of railways. A communication.

179. Edward Lloyd. Improvements in valves and in the valve-gear of locomotive and other steam engines.

185. Stephen Norris. Improvements in the manufacture of boots and shoes, and other coverings for the human feet.

190. John Strafford. Certain improvements in portable signal lamps for railway, marine, and other purposes.

207. Alexis Jean Dessales. Improvements in oil lamps, and in reflectors for the same, for railway carriages and other purposes.

209. Alexander Dalgety. An improved self-acting stand or tilt for casks or barrels.

210. George Napier. Improvements in the construction and arrangement of the flues, air passages, and other parts of furnaces, and also in controlling the passage of smoke, and in heating and regulating the supply of air to facilitate combustion.

230. William Asbury. A new or improved tap or stop-cock.

242. Henry Chance. An improvement in the manufacture of moulded articles when using vitreous materials.

250. Charles Frederick Claus. Improvements in the preparation of hides or skins, also applicable to the preparation of the entrails of animals.

274. Francis Preston. Improvements in machinery for shaping and rolling metal.

287. Benjamin Franklin Miller. Improvements in ventilators for chimneys and other purposes.

309. Thomas Hinchliffe. Certain improvements in machinery or apparatus for drawing and spinning wool or other fibrous substances, or wool mixed with other fibrous substances.

431. John Freer. Improvements in machines for planting grain and seed, and an improved seed feeder and meter for planting machines.

455. William Vincent Wallace and Benjamin Lawrence Sowell. Improvements in treating tobacco in order to manufacture cigars and other articles, for smoking, together with the manufacture of cigars and cheroots from the tobacco so treated. A communication.

573. Frederick Hale Holmes. Improvements in machines, known under the name of magneto-electric machines.

819. George Tomlinson Bousfield. Improvements in moulding planes. A communication.

841. Charles Durand Gardissal. Preparing various resins and combining them with oils and fatty matters for manufacturing candles thereof. A communication.

929. Edward Vincent Gardner. Improvements in furnaces.

948. James Nasmyth and Herbert Minton. Certain improvements in machinery or apparatus employed in manufacturing tiles, bricks, and other articles, from pulverized clay.

965. Thomas Jeacock. An improvement in knitting machinery.

1023. Samuel Dyer. Improvements in reefing, furling, and setting the sails of ships and vessels.

1034. Richard Archibald Brooman. Improvements in machinery for felting or planking hat bodies. A communication.

1045. Henry Edward Brown. Improvements in the description of hinges denominated concealed hinges, for carriage doors and doors of every description.

1046. Samuel Rooke. A new or improved manufacture of stair rods.

1047. Richard Archibald Brooman. Improvements in machinery for bending or shaping timber. A communication.

1049. Robert Tolmie Campbell. Improvements in machines for reaping and mowing. A communication.

1067. Thomas Huckvale. Improvements in implements for thinning and hoeing turnips and other crops.

1069. John Furnevall. Certain improvements in the construction of valves.

1078. Louis Fréderic Mayer. Improvements in photography.

1082. Jonathan Amory. Improvements in furnaces for locomotive and other steam boilers, which improvements are applicable to reverbera-

tory and puddling furnaces, and to furnaces for heating buildings.

1084. Richard Archibald Brooman. Improvements in machinery for felting or sizing hat bodies. A communication.

1086. William Edward Newton. Improved machinery for cutting, punching, and forging, or swaging nuts or washers. A communication.

1087. Alexander Charles Louis Devaux. Improvements in the construction of granaries.

1088. Alfred Vincent Newton. An improved construction of rotary pump. A communication.

1093. John Henry Johnson. Improvements in carding engines for carding cotton and other fibrous materials. A communication.

1096. Edward Daniel Johnson. An improved mode of mounting marine chronometers.

1097. George Jordan Firmin. Improvements in the manufacture of sulphuric, tartaric, citric, and oxalic acids, ammonia, and cyanides.

1105. Richard Archibald Brooman. Improvements in machinery for manufacturing tubes and pipes, applicable also to the rolling of rods and bars. A communication.

1108. James Wallace, junior. Improvements in preparing, bleaching, washing, cleansing, and drying textile fabrics and materials and pulpy substances.

1109. Robert Wotherspoon. Improvements in hats and other coverings for the head.

1118. Barnett, Samuel. Improvements in the manufacture of combs.

1129. William Edward Newton. Improved machinery for removing snow from railroad tracks. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

1853.

1258. William Chisholm.
1259. Louis Gervais Dieudonné Buffet Delmas Ducayla.
1267. Auguste Edouard Loradoux Bellford.
1271. Henry Turner.
1295. Alphonse Rene le Mire de Normandy.
1302. Julius Augustus Roth.
1313. Ebenezer Nash and Joseph Nash.
1316. Caleb Hill.
1350. Joseph Whitworth.
1366. Isaiah Kendrick.
1381. Benjamin Biram.

LIST OF SEALED PATENTS.

Sealed May 20, 1856.

2631. John Roberts.
2641. Augustus Dacre Lacy.
2657. John Wilkes.
2659. François Coignet.
2695. James Egleson Anderson Gwynne.
2699. Pierre Louis Bergeon.
2713. William Augustus Woodley.
2715. David Anderson.
2721. Alexander Watt.
2725. William Hartcliffe.
2913. William Symons.
2917. Richard Archibald Brooman.
2947. William Brown.
61. Edwin Thomas Truman.
93. William Owen.
267. George Hallen Cottam and Henry Richard Cottam.
393. Edmund Leach, James Leach, and Edmund Leach.
521. John Greenwood.
529. Henry Andrew Dewar.
621. William Edward Newton.
631. Charles Randolph and John Elder.
639. William Graham.
657. Ely Smith Stott.
677. John Henry Johnson.
705. William Foster.

Sealed May 23, 1856.

2640. Thomas Tuckey.
2644. Joseph Ellisdon.
2652. Juliana Martin.
2655. Louis Joseph Frédéric Marguerritte.
2665. Robert Bell.
2670. Enoch Tayler.
2675. George Louis Stott.
2693. Thomas Symons.
2700. John Ramsbottom and John Charles Dickenson.
2760. Henry Hart.
2773. Charles François Jules Fonrobert.
2785. Peter Armand Lecomte de Fontainemoreau.
2787. Josiah George Jennings.
2788. Josiah George Jennings.
2789. Josiah George Jennings.
2807. Isaac Beardsell.
2940. Henry George Bailey.
53. Samuel Cunliffe Lister and William Tongue.
136. Joseph Schloss.
380. Walter McFarlane.
434. John Henry Johnson.
458. William Strang.
537. François Rualem.
549. Thomas Lambert.
649. Peter Appleton.
691. James Bryant.
707. John Dearman Dunnicliffe and Stephen Bates.
761. John McLean.

Sealed, May 27, 1856.

2680. Thomas Warren.
2685. Benjamin Rosenberg.
2688. William Alfred Distin.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
April 29	3832	R. Thompson	De Beauvoir Town	Pocket Protector.
May 6	3833	J. M. Butt and Co.	Gloucester	Stench Trap.
" 7	3834	J. Cliff	Wortley	Sewer Block.
" 8	3835	Silverwood and Marsh	Sheffield	Brass-bound Square.
" 9	3836	E. Wood	Liverpool-road	Ever-pointed Pencil.

PROVISIONAL REGISTRATIONS.

May 5	764	J. Macpherson	Aberdeen	Fire Fan.
" 7	765	T. L. Henley	Calne, Wilts	Chimney Top.
" 10	766	J. R. Chirm	Birmingham	Castor.
" 10	767	W. Devon & G. Saunders	Stratford	Water Valve and Ball Apparatus.
" 21	768	J. Cooke	Colchester	Poultry Pen.
" 22	769	T. J. Shingleton	Bermondsey	Glove Fastener.
" 24	770	A. J. Marriott	Oxford-street	Ladle Pickle Fork.

NOTICES TO CORRESPONDENTS.

C. Atherton, Woolwich.—We were not well able to give place to your communication in this Number, but will endeavour to insert it in our next.

A. B., Patentee.—No notice need be given at the Office of the Commissioners of Patents. A. (who takes out his patent Dec. 28th, 1853) will have to produce his patent (which must previously be duly stamped at the Stamp Office) on the 27th of Dec., 1856, at the above-named office. For fuller information if you need it), write to the Patent Department of this Office.

CONTENTS OF THIS NUMBER.

Moore's Patent Mill for Grinding Corn (*with engravings*) ... 505
On Large Bells and Bell Machinery (*continued from page* 465) ... 506
On Petrifaction. By H. Prater, Esq. ... 509
The Smoke Act and the Potteries (*with an engraving*) ... 511
Robertson's Grooved-surface Frictional Gearing (*with an engraving*) ... 511
The Brussels Economic Exhibition ... 512
Trial of Steam Fire Engines ... 512
The New Atlantic Telegraph Cable ... 513
Bonelli's Improved Electric Conductors ... 513
Foreign Intelligence. By Dr. Lotsky:
Railroads in Towns ... 513
Academy of Sciences. Meteorology ... 514
New Scientific Instrument ... 514
How to Make the Most of London Bridge ... 514
A Smoke-removing Appendage for Furnaces. 515
Woodcock and Gardner's Patent Furnaces ... 516
Mechanical Locomotion ... 517

Specifications of Patents recently Filed:
Newton ... Dressing Flour ... 519
Oddie, Lancaster, & Lancaster ... Looms ... 519
Thornton, Thornton, Thornton, and Thornton ... Looped Fabrics ... 519
Hébert ... Ovens ... 519
Fairbairn & Haslem. Locomotive Engines and Carriages ... 520
Bailey & Quarmby ... Carding-Machines ... 520
Spence ... Sulphate of Alumina 520
Westrop & Sharman. Gloves ... 520
Tilghman ... Oily Substances ... 520
Kay, Richardson, & Mallinson ... Woven Fabrics ... 520
Moore ... Mill for Grinding ... 520
Lyall ... Spinning Machinery 520
Cockings and Potts.. Sockets for Whips and Candles ... 521
Greaves ... Steam Boilers ... 521
Thibierge ... Chlorine ... 521
Dewrance ... Pianofortes ... 521
Ullrich ... Passenger Indicator 521
Hemsley ... Embossed and Craped Fabrics ... 521
Bousfield ... Power Looms ... 521
Lozano ... Pyrites and Ores ... 521
Bousfield ... Looms for Weaving Wire ... 521
Stenhouse ... Decolorising Materials ... 522

Provisional Specifications not Proceeded with:
Gedge ... Reducing Drawings 522
Fairbairn, Fairbairn, and Fairbairn ... Casting Ordnance ... 522
Pyne and Malam ... Gas ... 522
Parry and Ivers ... Looms ... 523
Taylor ... Marine Engines ... 523
Reinagle ... Barrows, &c. ... 523
Gilpin ... "Raising Gig" ... 523
Adams ... Cutting Wood ... 523
Clark ... Cooking Apparatus. 523
Puls ... Coating Metals ... 523
Ward ... Clarionets ... 523
Gardner ... Dressing Grain ... 523
Livingston ... Permanent Way ... 523
Staadt ... Motive Power ... 524
Eavestaff ... Pianofortes ... 524
Moseley ... Cleansing Linen, &c. 524
Leftwich ... Water-closets ... 524
Provisional Protections ... 524
Notices of Intention to Proceed ... 526
Patents on which the Third Year's Stamp-Duty has been Paid ... 527
List of Sealed Patents ... 527
List of Designs for Articles of Utility Registered ... 528
Provisional Registrations ... 528
Notices to Correspondents ... 528

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1713.] SATURDAY, JUNE 7, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

BELLEVILLE'S SMOKELESS FURNACES.

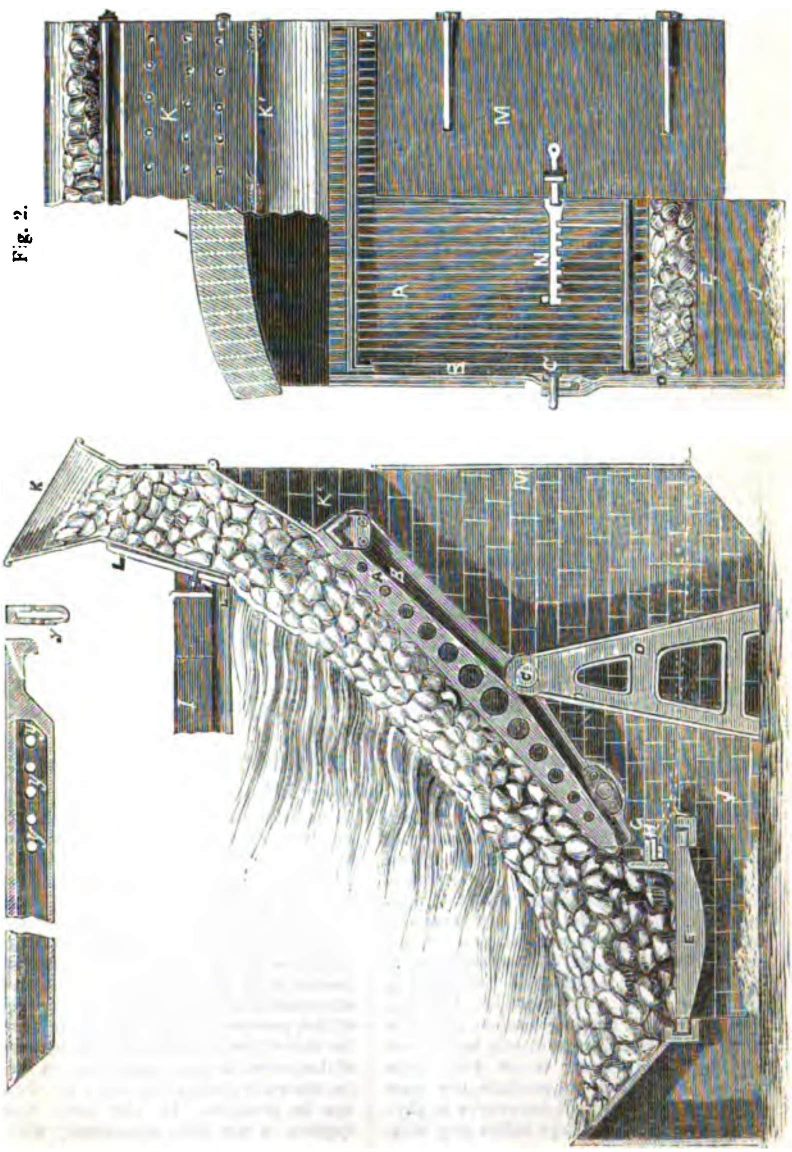


Fig. 2.

Fig. 1.

Fig. 4.

Fig. 3.

BELLEVILLE'S SMOKELESS FURNACES.

(Patent dated 9th October, 1855.)

M. Belleville, C. E., of Paris, has patented in this country a furnace construeted for the purpose of avoiding the production of smoke. This furnace is represented in the engravings on the preceding page, fig. 1 being a sectional elevation, and fig. 2 a front view with a part removed. The grate consists of a set of fire bars, A A, fitted into a frame, B, supported at an inclination on axes. C C, on which it is free to move. D D, are the bearings for the axes, C C. Instead of a frame as represented, the grate may be mounted on transverse supports, the ends of which rest against the sides of the ash-pit, or on other suitable framework. E E, is a small grate or set of horizontal fire bars placed below the grate, A; F is the furnace bridge; G, space between the grates, A and E, through which the scoria, cinders, &c., may be withdrawn while the furnace is at work. H is a stop plate, or apparatus for partially closing the space, G; I is the crown (which may be in brickwork or cast iron); it serves to keep the fuel hot as it descends; J, ash-pit, kept covered by a flowing film or stream of water, regulated by a cock; K is the feed hopper, or mouth of the apparatus. The shape of this hopper is something like the frustrum of a pyramid at the lower part. The peculiar shape given to the hopper is important, as on it the easy and regular descent of the fuel depends. The shape shown in fig. 1, in which the side presented to the fire bars is inclined while the front is straight, is preferred. K is an iron plate fixed to the grate, A; this plate is sharply inclined to assist the descent of the fuel. L is a register, placed at the back of the hopper, by raising or lowering which the depth of the mass of fuel on the fire bars can be regulated; M M, are registers at the front of the ash-pit; the extent to which these registers may be opened is regulated by the rack, N. These registers prevent waste radiation of heat from the grate. Apertures may be formed in the crown, I, near the hopper, for the admission of currents of atmospheric air to the fire place; this air feeds the flame and beats it down on the burning fuel, thereby assisting in consuming the smoke. Currents of air may also be admitted through the bridge, F, by curving it upwards in the centre, and constructing it of perforated cast iron. Figs. 3 and 4 show, in section, a hollow fire bar, which is found well adapted for the object of the invention; it is formed with side apertures, *y y*, through which the air which enters through the bottom of the bar escapes in a warm state into the apparatus, while the bar is kept cool by an outward current of atmospheric air. The apparatus works as follows:—Fuel is placed on the fire bars and lighted, and fresh fuel introduced through the hopper or mouth, K. This fresh fuel gradually descends as the fuel below it becomes consumed, and its volume thereby diminished, the combustion being regulated by a register in the chimney. As the fuel slides down from the hopper it becomes gradually heated, and liberates gases, which ignite as they become disengaged, and combine with the atmospheric air, passing through the fresh or not ignited fuel; as fast as the fuel slides down it becomes ignited, and cokes, and the residuum falls on to the bottom of the grate. The mouth of the apparatus is so formed that the depth of the charge of fuel is greater at bottom than at top. The fire bars need not be of the precise degree of inclination shown, but the inclination may be varied according to circumstances, provided that it is sufficient to allow of the gradual and continuous descent of the fuel, and of the depth of fuel being greater at bottom than top.

FARADAY'S EXPERIMENTAL RESEARCHES IN ELECTRICITY.

(*Concluded from page* 461.)

But to return to Faraday's argument. There is one idea in it which is perfectly good and philosophical when rightly stated. "The *conservation of power* is now a thought deeply impressed upon the minds of philosophic men." In this we cordially agree; but "conservation of power" is a very different subject of contemplation to "creation" or "annihilation" of power in the sense above employed by Faraday. The latter is a perfectly useless and vain speculation about things utterly beyond our faculties. The former is not only quite rational, but likely to produce the most important and brilliant discoveries in physical science, and perhaps before very long.

As an indication of the mode in which, probably, they may take place, we find a good illustration in the paragraph of Faraday's paper immediately succeeding that last quoted.

"Such, I think, must be the character of the conclusion, if it be supposed that the attraction of the sun upon the earth arises *because* of the presence of the earth, and the attraction of the earth upon the sun because of the presence of the sun, there remains the case of the power, or the efficient source of the power, having pre-existed in the sun (or the earth) before the earth (or the sun) was in presence. In the latter view it appears to me that, consistently with the

conservation of force, one of three sub-cases must occur: either the gravitating force of the sun, when directed upon the earth, must be removed in an equivalent degree from some other bodies, and when taken off from the earth (by the disappearance of the latter) be disposed of on some other bodies; or else it must take up some *new* form of power when it ceases to be gravitation, and consume some other form of power when it is developed as gravitation; or else it must be *always* existing around the sun through infinite space. The first sub-case is not imagined by the usual hypothesis of gravitation, and will hardly be supposed probable; for, if it were true, it is scarcely possible that the effects should not have been observed by astronomers when considering the motions of the planets in different positions with respect to each other and the sun. Moreover, gravitation is not assumed to be a dual power, and in them only as yet have such removals been observed by experiment or conceived by the mind. The second sub-case, or that of a new or another form of power, is also one which has never been imagined by others in association with the theory of gravity. I made some endeavours, experimentally, to connect gravity with electricity, having this very object in view (*Phil. Trans.* 1851, p. 1), but the results were entirely negative. The view, if held for a moment, would imply that not merely the sun, but all matter, whatever its state, would have extra powers set up in it if removed in any degree from gravitation; that the particles of a comet at its perihelion would have changed in character by the conversion of some portion of their molecular force into the increased amount of gravitating force which they would then exert; and that at its aphelion this extra gravitating force would have been converted back into some other kind of molecular force, having either the former or a new character, the conversion either way being to a perfectly equivalent degree. One could not even conceive of the diffusion of a cloud of dust, or its concentration into a stone, without supposing something of the same kind to occur; and I suppose that nobody will accept the idea as possible. The third sub-case remains, that the power is always existing around the sun and through infinite space, whether secondary bodies be there to be acted upon by gravitation or not; and not only around the sun, but around every particle of matter which has existence. This case of a constant necessary condition to action in space, when, as respects the sun, the earth is *not* in place, and of a certain gravitating action, as the result of that previous condition, when the earth *is* in place, I can conceive, consistently, as I think, with the conservation of force; and I think the case is that which Newton looked at in gravity; is, in philosophical respects, the same as that admitted by all in regard to light, heat, and radiant phenomena; and (in a sense even more general and extensive) is that now driven upon our attention in an especially forcible and instructive manner by the phenomena of electricity and magnetism, because of their dependence on dual forms of power."

With the latter portion of this extract we cannot agree; indeed we cannot attach any meaning to what he says about "the third sub-case." There is no sense in the phrase "power existing around the sun and through infinite space, whether secondary bodies be there to be acted upon by gravitation or not." But there *is* sense, and very good sense too, in the supposition that a force which at one time produces the effects classed under the head of "gravitation" may, at other times, manifest itself *in some other mode different from gravitation*, such as heat, light, electricity, &c., which is what Faraday refers to in his "second sub-case." With regard to his "endeavour experimentally to connect gravity with electricity," the remarks which we made in a former page of this Review (page 245), were not intended against this hypothesis in itself, but against Faraday's peculiar way of trying to prove it. The notice or hypothesis itself we consider not only a rational one, but one likely to produce good fruit sooner or later. Faraday's experimental attempt was founded, as he states, "on the thought that as two bodies moved towards each other by the force of gravity, currents of electricity might be developed either in them or in the surrounding matter in one direction; and that as they were by extra force moved from each other against the power of gravitation, the opposite currents might be produced." (*Experimental Researches*, p. 162.) Accordingly he endeavoured to obtain such electrical currents from "a falling body." But gravity does not cease to act on a "falling body;" nor is its force diminished in any measurable or appreciable degree in such exceedingly small motions as those under which such an experiment can be tried. Could Faraday have annihilated the *weight* (or pressure) produced by gravitation in any substance without producing the *other* effect of gravitation, viz., *velocity* or *motion*, then doubless he would have found some *new effect* (whether of the nature of heat, or light, or electricity, &c.) into which the original force would throw itself when prevented from manifesting itself *as weight* or *motion towards the earth's centre.*

To make our meaning plainer. If you rub two pieces of wood, or any other substance, together, the *mechanical* action becomes changed into heat (the heat of friction), or in other cases into *electricity* (as in the common electrical machine), or into *light* (as in other well-known experiments). That force which originally manifested itself as *pressure*, or as *motion in the two masses* rubbed together, now manifests itself as heat, or light, or electricity. The force of gravity itself is constantly seen manifesting itself in *two* different forms, viz., as *motion*, or (if motion be prevented) as *pressure* or *weight*. Annihilate the one, you get the other. Annihilate "pressure," you get "motion;" annihilate "motion," and you get "pressure." Now when the earth approaches the sun by gravitation, the force of *gravitation* is increased (inversely as the square of the distance of the two bodies). This *increase* of gravitation must (according to the hypothesis under consideration) be obtained *at the expense of some other mode of manifestation of the original force*. For example; there must be so much less "heat" in the universe, or so much less "electricity," or so much less "light." And the interesting question arises—Can we discover any such effect—any such "transmutation of force?" The reader who is interested in such subjects as this, may find some observations on it in a paper on "The Employment of Heat as a Motive Power," in the forty-seventh volume of this Magazine (p. 352, &c). We cannot, however, devote more of our space to its consideration at present, but must content ourselves with having pointed out how much of Faraday's notions on this subject is right and how much is erroneous.

Our review has already been extended to such unusual length, that we are compelled to omit all notice of several other interesting points treated of or suggested by Faraday. A very large portion of the latter part of the volume is taken up with those peculiar notions of his about "lines of force," of which we have already expressed our opinion; but interspersed with these queer and useless speculations and views, there are several things, both practical and theoretical, of a much more valuable nature, which we should gladly notice, had we the space. One, however, of this kind, we cannot pass over in silence, viz., the exceedingly interesting and important facts relating to telegraph wires insulated by gutta percha (pages 508—523, and 575—579). The bearing of these facts on the whole subject of electric telegraphing is of the highest practical importance, besides being of great *theoretical* interest. The question of the *velocity* of transmission of the electric current is deeply affected by it, and the enormous discrepancies between the velocities assigned by Wheatstone, the American experimenters, and others, seem here to meet with their explanation. We may perhaps devote a separate article to this important subject in a future number.

For the present, however, we take our leave of Faraday and his "Experimental Researches," hoping that we have neither wearied our readers by the length of this review, nor offended the admirers of our great experimenter by exposing what we conscientiously think the weak points of one for whom, on very many other accounts, we entertain the most sincere and profound admiration.

SIR JAMES SOUTH AND THE ROYAL AND ROYAL ASTRONOMICAL SOCIETIES.

(*Concluded from page 487.*)

The foregoing extracts from the letter of Sir James constitute a sufficient security against the detractions of Mr. Sheepshanks, and at the same time serve to render the shameless injustice of the councils of the Royal and Royal Astronomical Societies more apparent, and thus further show the pressing necessity that exists for reform in the constitution or operation of those societies. Sir James explains where the evil lies in the following plain and truthful paragraphs with which he concludes his letter:

"The councils of the Royal Society generally contain a certain number of titled or eminent persons, whose avocations preclude them from rendering proper attention to the scientific and ordinary business of the society. The result is, that *little men*, under the shadow of this aristocracy, have a commanding influence over the proceedings—elect their own miserable *toadies* to office, and do everything in their power to crush men of learning who will not be subservient to their selfish views and absurd pretensions; in fact, the working and unassuming men of science are insulted and oppressed by the *little men*, under the name of 'the President and Council of the Royal Society.'

"'Truth and justice' force me to say, that if the members of the council of the Royal Society were, instead of allowing the interests of science to be injured by a coterie of 'two or three make-believe philosophers,' to *reform themselves*, by adopting the valuable suggestions of their late president, the Earl of Rosse—alike distinguished for his learning, liberality, and *hospitality*—for increasing the number of the council, and other

useful reforms; and if the council of the Royal Astronomical Society were to govern its public proceedings in such a manner as to prevent the *noses* of their officers from being pulled by the members at the *scientific* meetings of their society, they would be more creditably employed than in interfering with the personal controversies of the fellows, and publishing, either through ignorance or malice, false and unfounded charges against myself."

We hope this controversy is now done with. It is desirable, indeed, that the councils of the two societies should make amends for the wrong and the folly imputable to them; but it is not likely that persons who are not sufficiently honourable and cultivated to avoid evil, will be sufficiently so to repair it. The whole subject must now be left to the general judgment, which is just. Sir James South has, as we anticipated, proved that he is equally able to despise calumnies when the feeble frame them, and to overthrow them when the strong adopt them.

This article, as far as the end of the preceding paragraph, was written and in the hands of the printer before the 26th of April last, on which day there appeared in the *Athenæum* a very singular review of Sir James South's pamphlet. If the reviewer had shown himself either able, unprejudiced, consistent with himself, or in any sense worthy to rank with the principal writers of the *Athenæum*, we should have hastened to deal with his statements and arguments; but as he is neither, we have suited our own convenience in publishing what follows.

We have called this *Athenæum* review a singular production; and that it is so our readers shall soon see—shall see, indeed, that it is so singular as to cause one to wonder whether the weaknesses displayed by the writer were natural or *artificial*—whether they proceeded from permanent defects, or temporary *excesses*. The first instance of his sagacity is shown as follows: alluding to the letter published in this Magazine in 1852, he says, "But the author or authors had so much shame as to couch the objects of imputation under Dick S********** and W******. The second name is apparent enough; but as the eminent and highly respected owner of it has treated the slander with the contempt it deserves, it is not necessary to *unstar* him." He here evidently shrinks from introducing the name of the person in question, and wishes to avoid mentioning it; and yet, a little further on, this sapient individual expressly mentions Mr. Sheepshanks as the "*old friend* of such men as Archdeacon Hare, Dr. Whewell," &c. How thankful will Dr. Whewell be to this critic for his literary effort! Will he not exclaim, "O that friends were wise!" For our own part, all that we feel disposed to say here, in reference to Dr. Whewell, is, that now his *Athenæum* friend has brought him forward in connection with Mr. Sheepshanks' smuggling transactions, we shall very carefully observe the course he takes in the matter. For many reasons we regret that the part taken by Dr. Whewell in importing the Jecker's circle has been dragged by his eulogist into daylight, instead of being permitted to remain in the mere *star*-light shed upon it in this Magazine.

Again: Sir James South attacks the Royal Astronomical Society, on account of certain abuses which it fosters; and, having in his mind the fact that an eminent member of that society had recently been observed to "pull the nose" of one of the society's officers, he says above, "If the council of the Royal Astronomical Society were to govern its public proceedings in such a manner as to prevent the *noses* of their officers from being pulled by the members at the *scientific* meetings of their society, they would be more creditably employed than in interfering with the personal controversies of the fellows, and publishing, either through ignorance or malice, false and unfounded charges against myself."

Now, the *Athenæum* critic is the defender of the Royal Astronomical Society. He has to vindicate its reputation, and to rebut the charges brought against it by Sir James; so to prove that the society is respectable, and the intimation of Sir James respecting the assault upon an officer an unfair one, he thinks it advisable to narrate the following circumstances: "At a recent meeting a fellow of the society, a man of impulsive character, and elevated by wine, did, in an apartment of the society, *after* a scientific meeting, for an imagined slight, attempt the nose of an officer of the society. Three other persons were present, one of whom interfered. The assailant apologized, and, in the words of the peacemaker, 'did all that a man could do.' The parties left the place in amity, and the assailant forwarded a letter of apology to the council for his want of self-government before the council had time to demand one."

After presenting Sir James and the world with this little additional anecdote, and remarking that Sir James is as impulsive as the gentleman alluded to, and that "his pluralization of details is the figure of Dickens's little nursemaid" (how can a "pluralization" be the "figure of a nursemaid"?) this intelligent critic adds: "So

much for this discreditable affair, the promoters of which must now do their best to live down, in quiet good behaviour, the unqualified condemnation with which society will visit them." Sir James intimated that an officer's nose was pulled by Mr. ——; and the critic, in order to damage the statement of Sir James, narrates that an officer's nose was "attempted" by Mr.——, and that the latter was drunken when he did it! Is not our judgment of this critic just?

A third example of the literary acumen of this gentleman is given in his remarks upon Mr. Babbage, whom he alternately assails and admires. In some passages he is satirical (in his way), in others sarcastic, in others insulting, in others malicious; and at the last, he says the statements made by Mr. Babbage at the Royal Society on the Swedish engine, are "so candid, so graceful, and so honourable to himself, that," in his own words, "he appears in a character the essential and complete opposite of that in which we (the critic) have been under the necessity of viewing him throughout the present article." What an unfortunate condition must this poor critic have found himself in on beholding the true Mr. Babbage, after having been "under the necessity" of so long mistaking the miserable phantom of his own imagination for that illustrious scientist! But while we pity the fatuous critic, we grieve that his fatuity found not a more appropriate sphere than the opening pages of the *Athenæum*.*

It sometimes, however, happens that individuals who stumble and reel in the oddest manner when they become literary, have, nevertheless, a solid basis of facts beneath them. Is this the case with this critic? It certainly is not. He commences by saying, "The facts connected with this singular production are as follows: In 1833-8, Messrs. Troughton and Simms brought an action against Sir James South to recover payment for mounting a large equatorial. The claim was resisted on the ground that the instrument was bad; and the court referred the cause to Mr. (late Justice) Maule, who, after years of evidence and inspection, awarded the whole claim against Sir James South, with costs." This is contrary to truth. The "costs" were never awarded. Again; according to this writer's own statement it appears that Sir James South, at the very worst, refused payment of charges which Mr. Maule would not pronounce just until he had taken years to examine them. But we confidently assert—and we speak with ample knowledge—that Sir James would never have contemplated resisting the payment had the mounting of the instrument been effected with any tolerable show of success; nor even at all, had not the malice and gross conduct of Mr. Sheepshanks embittered his feelings. We will not open up the whole question again; but the truth is, that Mr. Sheepshanks, in an evil hour, forced himself into the matter, actually locked Sir James for four months out of his own observatory, wrote impudent and vexatious letters in the name of Troughton and Simms, patched and botched the equatorial mounting, counselled Troughton and Simms to enforce (and probably increase) their charges, threatened the witnesses of Sir James, and fanned a contention, which he had himself kindled, until it became a flame that burnt for years, consuming many friendships, and doing much damage to science itself in this country. It is time that honest, self-respecting men withdrew from the companionship of such as he was, and it pains us to find, that even now he is gone the taint of his character remains upon some who continue among us.

But we must hurry on, and glance at the further statements of the writer. He makes many attempts to remove from Mr. Sheepshanks the charges of smuggling, forgery, and subornation of perjury. Now, Mr. Sheepshanks himself admitted the smuggling, and the forging of the name of Troughton; and as respects the false-swearing, it is sufficient to say that under the then law, a false oath *must* have been taken. All, therefore, that the *Athenæum* critic says in Mr. Sheepshanks' behalf on this matter is utterly undeserving of further consideration, particularly as the letters already quoted from Sir James's pamphlet are of themselves decisive upon the point.

This writer attempts to weaken the opponents of Mr. Sheepshanks by dividing them. He insinuates that Mr. Babbage probably had less to do with the letter sent to this Magazine than Sir James South alleges. But in this he displays his uniform stolidity. Why should not Mr. Babbage desire to see the immoral character of Sheepshanks made publicly known? The facts about the Jecker's circle were well-known to him, to Dr. Robinson, Mr. Francis Baily, Sir Francis Beaufort, and to many others. Sheepshanks was the sworn foe of Mr. Babbage, whose exposures of him had just appeared in the work on the Great Exhibition. It is beyond doubt that, under these circumstances, Mr. Babbage could

---

* Having shown that this writer's *thoughts* are so changeful and heterogeneous, it is unnecessary to mark the defect of his *words*, or we might pause over such passages as this: "He (Mr. Babbage) devoted a chapter to the intrigues of *science*, meaning Mr. Airy and Mr. Sheepshanks."

have no other wish but that the forgery and smuggling should be universally known. The publication of the facts had its legitimate effect, for it at once lowered Sheepshanks to his proper level, and clearly showed that Mr. Babbage's picture of his mean and vicious qualities in the "Exposition of 1851" was not over-wrought.

Another of this acute writer's strong points against Sir James is that in the letter of January 19, 1852, the author or authors placed stars instead of letters after the initial letters of the names. Now, the fact is, that in the original MS. of Sir James the names were given in full, and that it was our predecessor who introduced the stars, for reasons of his own. This is a very important point, for it shows that although both the individuals implicated were living, Sir James did not shrink from giving their names at length; and after this, who can suppose that his statements respecting them were untrue?

In another paragraph the *Athenæum* critic says that, to the charges laid against him, "Mr. Sheepshanks wrote a crushing reply, *to which* NO *rejoinder was made.*" Let our readers who perused the articles given in our Numbers for March 17th and 24th, 1855, judge whether this is anything less than an unmitigated falsehood. [See *Mech. Mag.* vol. lxii. pp. 242, 267, Nos. 1649-50.] The rejoinder there made was placed, in a separate form, in the hands of Mr. Sheepshanks and his coadjutors, such as they are, and were also transmitted to the two societies—the Royal and Royal Astronomical; and either that rejoinder or his own conscience silenced Mr. Sheepshanks thenceforth.

Afraid to charge Sir James with falsehood, this unfortunate writer imputes to him mis-statements, and ascribes them to a "tendency to absolute false image." As this theory is introduced to explain away well-established facts, we shall not examine it here, although it has some merit, and if applied in an analysis of the beclouded spirit-rappists of the present day, instead of that of a mind so singularly strong and clear as Sir James's, might lead to useful results. Moreover, as it is the only indication given throughout the article of skill on the part of the writer, our charity admonishes us not to look into it too closely.

Here is one sentence of this critic's which sounds magnanimous. He says, in reference to the charge against Sheepshanks, "Had the charge been true, and capable of proof, it would have made little difference in the judgment which ought to be formed of this part of their" (Mr. Babbage's and Sir James's) "conduct." This sounds well for a moment, but it is hollow notwithstanding. It would have been dignified and honourable to forget the crimes of Sheepshanks, if he had changed his conduct; but while he persisted in his evil, slandering, persecuting courses, it would have been unjust and unsafe to do so.

We have now done with this critic, who tries to write triumphantly. Whether any one could have handled the matter worse we cannot say, since we do not know the whole extent of the miserable clique who write to assail worthy men, and to defend the smuggler, the forger, and, virtually, the great criminal class.

We have done what we held it our duty to do in defence of Sir James, whose services in the cause of scientific reformation will not soon be forgotten; and we doubt not that every honest man who reads these pages will have no difficulty in determining on whose side truth, and justice, and honourable feeling lie.

ADCOCK'S MARINE ODOMETER.

Mr. J. Adcock, of Dalston, has recently patented an apparatus called a "Marine Odometer," or "Ships' Progress Indicator."* This instrument may be fixed in the cabin or other convenient part of the vessel, and is actuated by a column of atmospheric air confined in a tube connected at the other end with the driving apparatus, which may be placed under the stern, in or at the side of the keel of the vessel. The driving apparatus, which is acted on by the water as the vessel proceeds, consists of an open chamber or box, in which is mounted a wheel constructed somewhat like a screw propeller, and acted upon by the water passing through the box. On the spindle of this wheel is an endless screw working in the teeth of a wheel which, by means of a crank and connecting rod, gives motion to a blower. This blower may be formed of a cylinder divided by a transverse partition into two equal parts, and from each division or compartment rises a tube. The upper end of one of these tubes opens into the air chamber of the indicator above, and the other into the common atmosphere. The blowing cylinder has each of its ends closed by an India-rubber or elastic cover, moveable by the rod or the crank of the screw wheel, and the two elastic ends are made to act with each other by means of a connecting link, so that when one is drawn out the other is thrust in, thereby counteracting the gravitating tendency of the water, and by means of the column of air in the tube connected

* See page 535 of this Number.

with the air chamber of the indicator being thus set in motion by the blowing cylinder below, motion will be communicated to the corresponding elastic end of the cylinder of the indicating apparatus. The indicating dial is formed of three flat graduated rings, which are made to rotate one within the other. These rings are set in motion by the in and out action of the India-rubber cap of the air chamber of the indicating apparatus, and which motion actuates two clicks that are made to take alternately into the opposite teeth of a ratchet wheel, giving it thereby a revolving motion; and on the axle of this wheel is a pinion which gears in the teeth of a segment wheel mounted on the dial axis.

HARVEY'S APPARATUS FOR REMOVING HANKS FROM REELS.

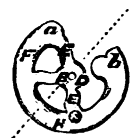
A VERY ingenious and useful apparatus for placing hanks, skeins, bands, and other articles upon reels, cylinders, or rollers, without raising the latter from their bearings, and for removing the same, has recently been patented by Mr. William Harvey, of Mansfield, a mechanic in the employment of J. Bradley, Esq., cotton doubler, of Mansfield.

The apparatus consists of a wheel, the nave of which is pierced to receive one end of the shaft or axis of a reel, cylinder, or roller, which is keyed or mounted upon it, the opposite end of the shaft or axis revolving in a bearing of any ordinary construction. A portion (about one-sixth) of the rim of this wheel is removed or cut away, and the edge of the remaining portion is grooved to receive a semicircular bearing, on which it rests.

The manner in which the invention is carried into effect is shown in the annexed engravings, adapted to a reel for reeling fibrous substances from bobbins, and forming the same into hanks; it will be understood, that a cylinder or roller may be substituted for a reel. Figs. 1 and 2 are a sec-

Fig. 1.

Fig. 2.



tion and elevation of the apparatus detached. Fig. 3 is a front elevation of a reel with the apparatus applied thereto, and fig. 4 is an

Fig. 3.

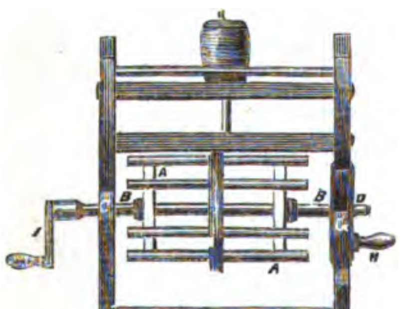
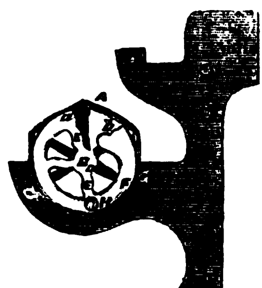


Fig. 4.



end view of the same. A A is the reel keyed on to an axis, B, with which it revolves. The axis is supported in an ordinary bearing at C, while its opposite end revolves in a bearing formed in a boss, D, supported by arms, E, E, in the apparatus, or wheel, F. This wheel has a portion of its rim from *a* to *b* removed, and the remaining portion thereof is grooved to fit upon a bearing, G, in which it is free to turn. H is a handle for turning the wheel, and I, a handle for giving motion to the reel. Instead of a handle a pulley may be fixed on to the axis to receive motion through a band from a steam engine or other prime mover.

To remove hanks from the reel, the wheel is turned until the open part is brought above the bearing; then the hank to be removed is drawn to that end of the reel to

which the apparatus or wheel is applied, and slipped off the upper side of the reel, and that part of the hank which is then loose is laid or placed in the opening in the rim of the wheel; a revolution which will bring the open part again above the bearing on the opposite side, and the hank or skein may then be completely withdrawn from the reel. By reversing this process, a hank or skein may be put upon a reel.

A NEW WEIGHING INSTRUMENT.

A new weighing instrument has just been invented by Professor Kaeppelin, and called by him the "hydrostat." It is based on the same principle as Nicholson's aërometer.

The "hydrostat" consists of a cylindrical case filled with air, hermetically closed on all sides, and entirely immersed in a vessel containing water, where it forms, as it were, a float. (In places in which the temperature is at freezing point, alcohol must be substituted for water.) Two plated steel wires are connected to the air case or float, and rise out of the water vertically. These wires are fixed to the extremities of a horizontal beam, having at its centre a rod, to which are suspended two dishes, placed one over the other. One of these dishes is for the weights which have been required to immerse the float; the other is intended to hold the substances to be weighed.

The instrument is made use of in the following manner: First, the fixed point at which the horizontal beam is stopped must be noted; then the substance to be weighed is placed on the proper dish, and weights removed from the other dish till the instrument returns to the original point of immersion. The weights removed will indicate the weight of the substance weighed.

The precision of the instrument will depend on the thickness of the steel wires, as the water displaced by them regulates the last and smallest fractions of the course of the float. The nicety of the instrument arises from the absence of all friction except that from the contact of the water against the surface of the float. It is, therefore, especially applicable for weighing precious stones, &c.

Changes of temperature affect the volume of the float as well as the density of the water; the "hydrostat" must, therefore, always be brought back to the fixed point, whenever it has departed from it.

The instrument has been applied with success by Messrs. Haussmann, Jordan, Hirn, and Co., of Colmar, for weighing cotton in the manufacture of table-cloths.—*Moniteur Industriel.*

THE RAILWAYS AND THE POST OFFICE.

In our number for the 19th of January last (No. 1693) we published the speech with which Robert Stephenson, Esq., M.P., inaugurated his chairmanship of the Institution of Civil Engineers. In that speech Mr. Stephenson referred to the facilities afforded by railways to the Post-office, and went on to state, that without railway facilities it was not too much to say that the excellent plans of Mr. Rowland Hill, for the reduction of the rates of postage, could not have been carried out to their full extent, and to give reasons in support of that position. In the "Second Report of the Postmaster-General on the Post-office," dated January 30th, 1856, and presented to the Houses of Parliament by royal command, observations are made upon the railway companies of England, and upon Mr. Stephenson's statements. To these observations Mr. Stephenson replied at the meeting of the Institution of Civil Engineers on the 20th of May, in a speech which is very remarkable for its power and clearness.* His speech, which was received with considerable applause, was, at the unanimous request of the meeting, ordered to be printed *in extenso,* for the use of such members as would apply to the secretary for copies.

MERCHANT SHIPPING REGISTRATION ACT.

[We have received the following letter from Mr. Atherton in reply to our recent papers on the above subject. The remarks which we intend to make in answer to Mr. Atherton are already in type, but we are compelled to defer their publication till next week.]

To the Editor of the Mechanics' Magazine.

Woolwich Dockyard, May 27, 1856.

Sir,—My attention having been directed to the *Mechanics' Magazine,* Nos. 1705, 6, 7, 8 and 10, containing a review on the paper "Tonnage Registration," read by me before the Society of Arts, London, on the 16th January last, I am glad to find that you regard the subject worthy of being brought before the attention of the numerous readers of the *Mechanics' Magazine.* Indeed, there can be no question that the public generally, who, as consumers, pay the whole cost of production and delivery of the goods consumed, including freight and maritime insurance (the value insured being said to be no less than 600 millions

* A very able letter respecting the Post-office service on railways has also very recently been published by Lord Kinnaird.

per annum), are deeply interested in shipping registration being made duly effective for promoting safety at sea, and all other objects, both mercantile and scientific, conducive to maritime transport economy.

With reference to my paper, "Tonnage Registration," as published in the *Journal of the Society of Arts*, for the 18th January, 1856, but which I regret did not appear in the *Mechanics' Magazine* previously to the publication of your review thereon, the first point now requiring attention on my part is to disabuse the minds of your readers as to the inferences and gratuitously assumed conclusions which your review, in common with others who have taken part in this discussion, have been pleased to represent as the purport of my paper; hence, misstating my case, and attributing conclusions to me which I disavow. For instance, by my paper I did not object to internal roomage as one element of tonnage registration; but I upheld it as indispensable to a complete system of registration, suggesting, however, in addition, that shipping registration ought to record the capability of ships for carrying weight of cargo with reference to some *limitation* of draught, and that the actual draught at which ships leave port ought to be officially recorded for the purpose of affording some check on the overloading of ships by rendering legal proof on this vital point available in the case of judicial inquiry as to the cause of wreck and loss of life, or damage to property at sea. These are suggestions which constitute substantially the sum total of my imputed "condemnatory harangue" against the merchant shipping law of "1854." It has been to gloss over my expositions of these deficiencies of the law, and thus counteract the proposed amendment of the law that I am dignified as the Coryphæus of agitators against the law. This, in reality, is Mr. Atherton's "attack on the shipping interest which has given such dire offence;" but I beg to apprise the readers of your review, that I regard all the imputed personalities which have been laid to my charge as mere delusion, put forth to divert attention from my exposition of the fact that our present system of shipping registration affords no certain or even comparative measure of the tons weight of cargo that ships will safely carry; nor does it afford any direct check to the unsafe loading of ships, or prescribe that any official record be taken of the draught at which ships leave port, to be received as evidence in the case of judicial inquiry as to the cause of wreck or damage of cargo at sea. Such are the deficiencies of the Act of "1854;" and if a law be not effective for the checking of abuse, it is sure to be effective for the cloaking of abuse, and consequently conducive to the propagation of abuse; and these, I maintain, are the characteristic features of the Merchant Shipping Act of "1854," as respects part 2 on the Measurement and Registration of Shipping. Again; in judging of my expressions with respect to their personal application, some attention ought to be paid to the distinction whether I am the originator of an argument, or the constrained respondent to an argument. Be it observed, that in bringing forward the question of tonnage registration before the Society of Arts, I did not originate, but I had to meet, the argument which had been previously advanced in support of the Merchant Shipping Act of "1854," to the effect, that that Act ought not to be questioned or impugned, because the shipping interest had declared themselves satisfied with the Act as it is, and had not put forward any petition to the legislature for the amendment of the tonnage registration clauses. It was to meet this singular doctrine, most convenient as respects class legislation once achieved, but monstrous as respects permanent public interests, that I challenged precedents in language which your review is pleased to compliment (page 343) as "Mr. Atherton's indignant eloquence, all very fine, but quite beside the question," to refute the allegation that no chartered institution, public trust, or corporate body of any kind, whether political, mercantile, or professional, has ever yet been known, voluntarily, to originate self-corrective reformation at a sacrifice to its own exclusive and once legalized or prescriptively usurped immunities, privileges, powers, or profits, purely for the sake of public good. Hence, I ventured to remark that we have no right to expect that the shipping interests should, in these days, and, as times go, all at once become purists, *par excellence*, and constitute themselves the exception to the general rule. Here was an insult to the shipping interests! How have I in consequence been charged with slander and put on my defence! but I need not further plead my own cause, for your review itself briefly sums up this little episode in the following words, page 340:

"Mr. Atherton's assault provoked one or two replies from shipowners, who felt their craft insulted by some of his remarks, showing a sensibility on the occasion which would go far with some people to prove the truth of those imputations they are so ready to extract from Mr. Atherton's words." Your review further observes, page 342: "We do not think Mr. Atherton meant to make any serious charge against the shipping interests."

I thank your review for this remark, as

showing your own impressions on reading my paper; but I cannot accept the proffered defence as to my not having *meant* to make any serious charge and offer so meagre an apology, if any be due, for I always try to write as nearly as may be what I mean. I deny *in toto* that my writing admits of any personally offensive construction: I addressed myself to a system of public registration, which I regard not merely as deficient for good purposes, but delusive and mischievous in its immediate effects on public interests, and I denounced it as such; but, immediately on finding that my exposition of the deficiencies of our system of tonnage registration had been diverted into a charge of personal defamation, I took an early opportunity in the course of this discussion of publishing as follows:

"Can it be said that there is any sentence in my paper unbecoming and not fairly within the bounds of argumentative propriety? If such be the opinion of the council of the Society of Arts, or of the chairman of the meeting at which my paper was read, I regret it, and I claim the privilege of retracting it." Here again I meant what I wrote.

Now, to return to our subject:

In suggesting that tonnage registration ought to embrace the capabilities of ships respectively for carrying weight of cargo as distinguished from roomage for cargo, I anticipated being met by that hackneyed argumentative stopper, "impossible!" by remarking, that the capability of a ship for carrying weight would be deducible from the displacement contained between the actual water line or plane of flotation of the ship when light, ready to receive her cargo as given by the ship herself, and the load-line limit of draught for which the ship may have been designed by its constructer, or which may be officially assigned to her; showing also, at the same time, by reference to the catalogues in Fincham's "Naval Architecture," pages 248, 267, 321 to 327, and 405 to 410, that ships of all classes, both naval and mercantile, sailing ships and steamers, are constructed, and their capabilities for carrying weight are calculated by British, French, Russian, and Swedish shipbuilders with reference to a determined deep-draught line, which limit of draught or load line is in the hundreds of ships tabulated by Fincham, specified and recorded in feet and inches fore and aft as the contemplated limit of the loading. Still this reference to and recital of Fincham's catalogues in proof of the practicability of officially assigning a load-line limit to every ship is quietly ignored by all who have taken part in this discussion. Fincham's catalogues, though thus pointedly adduced by me, are not even noticed in your review of my paper, and thus the suggestion for registration of the capabilities of ships for carrying weight with reference to the deep-draught limit assigned by the constructor has (Fincham's catalogues notwithstanding), been simply denounced by some as "impossible," and avoided by others with silence.

Your review is, however, constrained to acknowledge, and at the same time to palliate the fact of the insufficiency of the law of "1854" in the following terms (page 341):

"The tonnage-measurement and registration of vessels has never been fairly brought before government in any other than a purely fiscal point of view: Mr. Atherton is the first agitator that we know of who has insisted upon the scientific features of the case, and those which bear upon the dangers of the sea voyage."

Again, at page 343, your review admits as follows: "Undoubtedly it would be very desirable, if possible, to fix a limit to the degree to which ships may be loaded."

And again: "There is, undoubtedly, a point beyond which ships cannot be safely loaded."

These acknowledgments completely establish the fact of the existing deficiencies of the law on which I have based my paper and suggested specific remedies. Your review admits the grounds on which "Coryphæus," the agitator, has based his "condemnatory harangue;" and although your review sets up the defence that "the tonnage measurement and registration of vessels has never been fairly brought before Government in any other than a purely fiscal point of view," you all at once abandon that explanation, and affirm that the system of admeasurement prescribed by the Act does effect all the objects of complete registration; for at page 342 we read as follows: "Of this, however, we are satisfied, that if a shipowner stipulate for a ship whose registered tonnage shall be 1,000, he need be under no apprehension as to its capabilities of carrying 1,000 tons weight or 1,000 tons of measurement of light cargo at the usual conventional measurement of 40 cubic feet to a ton."

Now on this point I join issue with your review. My challenge of the registration is this: that internal roomage measuring, as prescribed by the Act of 1854, up to the deck, without reference to any plane of flotation at which the ship may put to sea, affords no guarantee or measure as to the actual or even to the proportional tons weight of cargo that ships, as floating vessels, not submerged catamarans, will carry. Some ships of 1,000 tons register,

that is, 100,000 cubic feet internal roomage, may safely, so far as flotation is concerned, be loaded with 1,500 tons weight of cargo, and in addition thereto 1,500 tons by measurement of light cargo at 40 cubic feet to a ton, being altogether 3,000 tons of cargo, or three times the amount of the register tonnage chargeable for freight, whilst other ships of 1,000 tons register may be loaded to the utmost limit of safety with only 500 tons of cargo on board, or only half the register tonnage. As for steamers, I see no limit to the possible ratio between their register tonnage and their capability for weight cargo. Thus we may have two ships of the same register-tonnage, say 1,000 tons; one of them may be loaded with 3,000 tons of mixed cargo for freight, whilst the other may not be capable of safely carrying more than 500 tons weight of cargo; yet your review informs us (No. 1706, page 368,) that the present system of tonnage registration has been "enacted with the sole view of levying tolls fairly." Your review calls upon me to name the ships that will substantiate my statements. I decline thus to show up the shipping of any individual; and I should have supposed that the case of the *John*, with which in this discussion I was so perseveringly taunted, might have satisfied you as to the unfairness of this tampering with private interests in matters of public discussion. Shipowners have a just right to keep to themselves, if they so please, all the mysteries of their craft not exacted of them by the requirements of the law; but if your review be over-exacting in this matter, the records of the transport service, during the late war, will doubtless afford much statistical information on this subject. The obvious explanation of the above asserted discrepancies is that ships cannot be immersed up to the very deck to which the registered tonnage is measured, and thus put to sea with the deck awash in smooth water. Ships at sea are commonly liable to lie over as much as 30°. I do not pretend to dictate the maximum or minimum angle for which provision should be made. If, however, we assume not 30° but 18° only as the maximum safe lie over of the ship, then in this case the load-line limit of the ship in smooth water would be at the distance of one-sixth part of the beam below the deck amidships; and the number of tons weight, including the weight of the ship itself and its equipment, that would be required to immerse the ship down to this assumed load-line, namely, one-sixth part of the beam below the deck, will depend on the proportion which the *immersed* portion of the ship bears to the portion not immersed; that is, on the proportions of length, breadth, and depth, and character of the lines to which the ship of, say 1,000 tons register, may have been constructed. In fact, the principle of basing tonnage admeasurement on the entire internal roomage measuring up to the deck above the plane of flotation at which ships can safely go to sea, does not fulfil the conditions set forth by your review in the quotation above referred to as guaranteeing any definite capability for carrying weight based on the register tonnage. The doctrine thus asserted by your review, namely, that the displacement or capability of ships for weight cargo is closely proportional to their internal roomage, is based in the first place on the untenable assumption of a proportional scale of scantling or build; and even in the case of proportional build, it only holds good with ships sunk or water-logged, deck awash, full, may be, of dead men's bones—a precious condition of things for constituting the only base of tonnage registration; a precious price at which to purchase the equity in levying tolls before referred to, possibly liable to vary in ships of the same registered tonnage in the proportion of thirty to five, if charged against their tonnage of freight cargo.

As regards the practical operation of this new system of tonnage admeasurement, tending, as your review asserts, to remove the obstacles to improvement which existed under the old system of builders' measurement, all the evils of which system your review is pleased to say would be continued by adopting the system of registration suggested by my paper, I beg to observe, in the first place, that my proposed system of tonnage admeasurement and registration does not supersede the internal measurement prescribed by the law of "1854," and which your review holds up as the panacea for all evils, but adopts it as giving the capability of ships for carrying a definite quantity by measure, provided that the said quantity be not so heavy as to sink the ship; and to check the occurrence of such a catastrophe, I propose that the registration embrace the capability of the ship for carrying weight; and to prevent abuse in this respect, in defiance of the registration, I have suggested that the draught at which ships leave port be officially recorded by some person not interested in the loading of the ship. How these additions to our registration can mar or neutralize the efficacy which your review attaches to the roomage-registration alone, I cannot discern. I, however, do perceive that this system of registration and record, so "un-English, tyrannical, and inquisitorial," would afford evidence whereby the cause of wreck might be judicially scrutinized more closely than is possible under the restricted registration prescribed by the

Act of "1854," especially as respects the question whether such wreck may be attributable to causes for which the owners or charterers may be held pecuniarily responsible, or to causes for which the parties in charge of navigating the ship are responsible by imprisonment, or such like non-pecuniary, but personal punishment. What signify penalties imposed by law on proof of fault, if the same law, by the insufficiency of its enactments, obstructs all proof touching the loading of ships, as is the case with the Merchant Shipping Act of "1854?" On this point also, your review, although verbosely condemnatory of my paper, is constrained to make the following concession (page 343):

"In case of accident, and the consequent inquiries instituted by the Board of Trade, this circumstance (overloading) proved regularly in evidence by persons conversant with these matters, should have its due weight, and remove the accident from the category of those over which the owners have no control. Let the Board of Trade have, if it so please, properly authorised officers to note and record these facts."

"Coming events cast their shadows before."

Now, really, after these concessions on the part of your review, so substantially confirmatory of my paper, I may leave to be disposed of by the winds all the mere assertions, and utterly unfounded and inapplicable popular plausibilities about the baneful effects of government interference which constitute so large a portion of your review, as published in Nos. 1705, and 1706 of the *Mechanics' Magazine*.

I will, however, add a few words on the type of ships as affected by the law, and also dispose of the measurement or mode of measurement question to which your review has so copiously directed attention in Nos. 1707, 1708, and 1710 of the *Mechanics' Magazine*.

On the type of ships as affected by the law of admeasurement, it is questionable whether the admitted improved type of shipping, which of late years has been gradually introduced, is attributable to any changes which have been made in the law of tonnage-admeasurement and registration. So far as the builders were concerned, their pecuniary interest was under the old law decidedly opposed to the production of the deep and bluff type that formerly prevailed; for by the old law of tonnage measurement the builders' payment was based on length and midship breadth only; his interest therefore was to build as shallow and as sharp a ship as he could induce the shipowner to accept; but the interest of the shipowner, on the contrary, was to get as burthensome a ship as he could for his money, or a ship deep and bluff, so as to carry a large cargo in proportion to the nominal tonnage. Thus, under the old law, the interest of the builder was in opposition to the production of the old deep and bluff type. The cupidity of shipowners thus to retain control over the builders, and get an indefinitely burthensome ship under a limited nominal tonnage, has been one of the causes why the old law of builders' tonnage, which was repeated in "1833," has continued up to the present time (1856) to be generally upheld as the base of building contracts. Of late years, however, competition in trade, especially as respects steamers *versus* sailing vessels, has enforced an improved type of build; but if the register tonnage, based on internal measurement under the law of "1854," should now be recognized as the base of building contracts, it will then only be by the deep loading of ships, thus encroaching on safety, that the cupidity of shipowners and ship-charterers to carry the heaviest possible cargo in proportion to the registered tonnage will be gratified. Hence, the necessity for registering the limitation of weight, which the loading ought not to exceed.

As respects the mode of measurement, I regard this as a question of detail; and I have already published my views thereon, as follows:

"I do not take credit to myself for having devised any new mode of admeasurement; I have merely suggested that, as shipbuilders generally object to their lines being taken off, and their peculiar type of form ascertained in a manner which admits of its being appropriated or pirated by others, as is done in the system of measurement prescribed by the law of '1854,' if these objections on the part of builders be held to be reasonable, I have suggested that we may approximate very closely to the required cubical capacities of ships, both externally and internally, by adopting the principle of the French system; namely, taking cognizance of the three dimensions, length, breadth, and depth, and correcting the cubical product by a factor, the said factor to be either a medium constant quantity, or be subjected to a prescribed scale of variation to meet extreme cases, as may be determined. If, however, the objections of builders to the exact taking off the lines of their ships be overruled for the public good, in this case I do not hesitate to bring before the notice of any committee that may be appointed to investigate this question, that the system of shipping admeasurement originally adopted in '1829,' by Mr. James Peake, a shipwright officer in Her Majesty's service, and practised by him since that

date, is a system preferable to that which is prescribed under the Act of '1854.' Any two really scientific systems of admeasurement, such as Sterling's rule and Peake's rule, will produce closely identical results. It is, therefore, not so much on the score of superior accuracy as on the score of superior applicability and facility of being mentally understood by the operator that Peake's system is to be preferred."

As regards Peake's system, it includes a closely approximate measurement of the curved spaces, whether convex or concave, by which the real form of a ship between the extremities of the ordinates of measurement differ from the straight line; whereas, by Sterling's rule, no notice whatever is taken of the curved portions above referred to. Peake's system is, therefore, in fact, the more correct of the two. A further advantage of Peake's rule is, that the sections of the vessel may be taken at any parts most conveniently accessible, and not necessarily equidistant; whereas, by Sterling's rule, it is essential that the ordinates of the respective sections be equidistant, and that the sections themselves be equidistant from each other.

In regard to Sterling's rule, as your review in Nos. 1707, 1708, and 1710 of the *Mechanics' Magazine* elaborately expounds the *rationale* of Sterling's rule, for the edification of the numerous readers of that useful and deservedly popular periodical, arriving at the following conclusion:

"The wonder is, that a rule for the calculation of the cubical contents of an irregular solid is capable of so satisfactory and simple an explanation;" and as I have no more desire to depreciate Sterling's rule than I have to depreciate any other mathematical exposition, I will not say one word in question of the congratulation with which your review greets the readers of the *Mechanics' Magazine*, on the subject of your exposition of Sterling's rule, as the base of the rule for tonnage admeasurement, under the Act of "1854."

The modes of approximately measuring a ship admit of several variations; but I regard the mode of measurement as a mere matter of detail, not affecting the vitals of the Act of "1854," although it is the point to which your review, after having substantially admitted the deficiencies of the law which constitute the subject matter of my exposition, has almost exclusively directed attention in Nos. 1705, 1706, 1707, 1708, and 1710 of the *Mechanics' Magazine*.

I am, Sir, yours, &c.,

CHAS. ATHERTON.

WOODCOCK AND GARDNER'S PATENT FURNACES.

To the Editor of the Mechanics' Magazine.

SIR,—Mr. Woodcock, in your Number of this day, wishing to bring me within the class of "re-inventors," observes, "His patent diffusion plate has been previously used, and also patented." As I have never heard of such, perhaps he will say when and where this has been done. My patent of 1839, however, was not for "a diffusion plate." It was for the mode of introducing the air to the gases in furnaces, by numerous distributors, to enable it more rapidly to mix with them, &c., and which Mr. Woodcock has so closely imitated, although he dwells so much on his hanging bridge, which is wholly unnecessary, and his impinging the smoke and gas against the hot fuel, which is equally unnecessary, and may be injurious to the draught.

Mr. Woodcock says, "Mr. Williams will have hard work to prove that Watt was in error." That work has, I trust, been effectively done in my essay, now in course of publication.

"Hot air," Mr. Woodcock says, "should be given to the gases in order to prevent their being cooled down below their flame points." How the carbon of flame, then, at the temperature of incandescence, or 3,000°, can be heated by hot air, perhaps at 200° or 300°, or by his very erroneous impinging process, he has not explained.

It would occupy too much of your space, or I would have with pleasure shown Mr. Woodcock his several errors in speaking of carbonic oxide. So as to the other points of his letter; but which, as they are merely personal, have no claim on your columns.

I am, Sir, yours, &c.,

C. W. WILLIAMS.

Liverpool, May 31, 1856.

MECHANICAL LOCOMOTION.

To the Editor of the Mechanics' Magazine,

SIR,—It appears that Mr. Cheverton, resenting what he is pleased to call my "unfair mode of conducting" the present controversy, refuses to hold any further communication with me. Of course, I can have no objection to this; although I much fear that the real cause of his resentment is, that I did not permit him to reap the fruits of his "unfair" attempt to base the controversy on the effete and senseless cry of Practice *v.* Theory; and that I did not bend my back to receive, meekly and submissively, the heavy blows he was pleased to inflict. But I have reason to complain,

that while he professes to have done with me, under cover of addressing himself to "C.," he directs all his remarks to points which I have advanced. This may be, in his opinion, a fair way of conducting a controversy; but against this—as "protesting" seems the order of the day—I beg to enter my protest.

I shall not trouble myself to make any elaborate answer to Mr. Cheverton's last letter, but merely address myself to one or two little points which seem to require notice, in order to set me right with your readers. If the word "strain," in place of "power," occurred in my manuscript, I beg to retract it; and I can only account for its occurrence by the hurry with which, in a multiplicity of business, I am obliged to write the letters which I address to you. I have no wish to invest Mr. Cheverton's remarks with any greater degree of "confusion of ideas" than naturally belongs to them.

Mr. Cheverton protests against the application of the equation ($Pa=Qb$) in cases of this kind. As far as I am concerned, I have never employed equations of the kind, except by way of illustration, and have always strictly guarded myself by stating that they can be true only when the motion is *strictly uniform;* but I never considered any one of them as "equivalent to the representation of work as the product of force and space," in any sense, simply because it has no reference to "work" at all; and Mr. Cheverton's bold assertion, that it is such a representation, goes far to justify the opinion I have expressed, and which he quotes in a note to his last letter. By-the-bye, it appears that Mr. Cheverton never meant to assert that the motive power was applied at the screw-blade; but at the rowlock. How, then, can there be two distinct pressures at that point—the pressure on the rowlock as a fulcrum, and the pressure on the screw-blade applied through the rowlock?

That gentleman finds fault with what he is pleased to call "a fastidious correctness in the employment of words." This is only a confession of that vagueness which I have asserted to be a characteristic of "practical men," and which certainly often stands them in good stead. I may, however, remark, that "pressure" is only a particular manifestation of force; and that the latter word is used quite correctly in the sentence on which he comments.

In conclusion, Mr. Cheverton's resentment I can easily understand, and I trust that the controversy may teach him at least one lesson, viz., that when "clap-trap" cries are used to raise an unfair prejudice in favour of one of the parties concerned, it is not always the party on whom such "heavy blows" are dealt that "comes to grief."

I am, Sir, yours, &c.,

W.

London, May 31, 1856.

To the Editor of the Mechanics' Magazine.

Sir,—Mr. Rock appears to me unable to explain the contradiction which I pointed out in his first letter. I understood him to refer, as he says now in his attempt to clear up the point, to the axle of the fore wheels in the first case, and to that of the driving wheel in the other, and represented it as such; so that I am at a loss to perceive any point in his explanation that it was to those axles that he referred. I thought it likely that, if he did not consider it essential for both of the "supports" to be wheels, he would reply that my idea of bringing the front of the engine down to the rails involved two points of support, and that, if so, I would refer him to a further step in the same idea, which I have often speculated upon, namely, to place the boiler right on to the rails, on only one surface or point of support, and let it propel itself, and any one upon it, by pistons from its side striking horizontally, or obliquely upwards against projections at the road side, which might easily be made to lean forward by gravity and supply fulcrums for "continuous locomotion." I drew a diagram like this nearly three and a half years ago. But Mr. Nichols' argument, that a boiler might be slung (by braces radiating downwards from a collar passed over the axle, for instance) under the axle of a single broad wheel or pair of wheels, and operate by pistons connected to the crank-pin on the wheel, proves, I think, unanswerably, that Mr. Rock's "fundamental condition" cannot be sustained. The boy on the ball might "locomote" on his heel or toe only, and so absolve himself from Mr. Rock's law. I thank Mr. Rock for his offer, and would avail myself of it if we were neighbours.

I am glad to see Mr. Cheverton's denial of the blade end of the oar being the point of the application of the useful effect, and the tolerably clear recognition that the propulsion is effected by pressure on the rowlock.

I have always represented the motion of a boat, when rowed as ordinarily, as analogous to the case of a locomotive with the crank *above* the centre, and not as the case of a locomotive in the whole revolution, as "W." intimates; and I would suggest to him that, as he thinks it worth while to reply to my letters, it would be equally worth while to obtain a completer knowledge of them than it is very obvious he

possesses. "W.'s" ideas of "reaction" seem to me to be very imperfect: "reaction of the ground" is a strange expression, but perhaps is only a loose way of saying "reaction of the force;" but I am sure that "W." might attain to clearer and completer views on these subjects than his letters manifest (witness his retaining the "monstrous error," as Dr. Lardner calls it, that the friction is the same at different speeds), if his intelligence were less rigidly bound by ideas and studies apparently of too early date to embrace all that is now known respecting the locomotive engine. In all the letters which have been published, no one has attempted to trace the propelling force from the rim of the wheel into the thing to be propelled, the mass of the engine. Even Mr. Rock, who traced the power so rigidly in the case of the crank below the centre, leaps, like his fellows, when taking the case of the crank above the centre, to the conclusion, that because the wheel cannot turn round without the engine moving (except it slip), it must *cause* the said motion; although, as I have previously remarked, that might be said of every wheeled vehicle, and would prove that the wheel moves the cart, instead of the cart the wheel.

I am, Sir, yours, &c.,

C.

May 31, 1856.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

DODDS, T. W. *Improvements in fire-arms and ordnance, and in the projectiles to be used therewith.* Patent dated October 15, 1855. (No. 2302.)

This invention consists—1. In employing a small barrel or ram formed of cast-steel or other suitable material, bored or chambered out so as to receive the charge of powder. This is mounted in a strong wrought-iron socket provided with trunnions. 2. In strengthening cast-iron mortars of the ordinary construction by inserting a cast-steel breech and lining into them. 3. In mounting ordinary cannon and mortars by making a cast or wrought-iron socket or ring separate from the barrel, and providing it with suitable trunnions, so that in the event of the trunnions becoming broken, a new socket or ring and trunnions may easily be fitted thereto.

BROWN, J. M., and T. BROWN. *Improvements in the manufacture of folding chairs.* Patent dated October 15, 1855. (No. 2305.)

The invention is particularly applicable to folding chairs where the material constituting the back and seat is suspended from the upper part of the back and fixed to the front rail of the seat. The upper part of the frame constituting the back is made, when out of use, to fold by the side rails of which the back frame is composed, being each made with a joint which will admit of its folding. In like manner the lower part of the frame which supports the seat and upholds the chair at the back may be similarly formed to fold at the lower part thereof.

NEGRETTI, E. A. L., and J. W. ZAMBRA. *Improvements applicable to self-registering gauges, thermometers, barometers, and other mercurial meteorological instruments.* Patent dated October 15, 1855. (No. 2306.)

This invention is to secure the indication of the minimum point to which the column of mercury has fallen since a prior observation was made. The patentees employ a small conical plug or plunger, having pointed ends, and inserted in the tube above the column of mercury, being capable of moving freely in the bore. As the mercury descends therein the plug will of course fall with it; but when the mercury ascends in the tube it will pass the lower pointed end of the plunger and rise above the same, without raising the plunger, which thus becomes an indicator. Another improvement consists in constructing thermometers which will indicate both the minimum and maximum temperatures. For this purpose two tubes are adapted to one bulb, and one of the tubes must be partially choked (or one more than the other) at or near the neck. This compound thermometer is based upon the principle that the mercury will have a less tendency to rise in the one tube than the other, owing to the greater obstruction in the one than in the other.

THOMSON, G. *Improvements in steam engines.* Patent dated October 16, 1855. (No. 2308.)

This invention has relation to the valvular arrangements of steam engines, and is intended for the purpose of cutting off the steam so as to secure economy in its expenditure, and render uniform the action of direct-acting engines. In applying it to a pair of direct-acting marine engines, the whole of the valvular apparatus may be disposed between the two steam cylinders, a single valve chest answering for both cylinders, the cylinders being opposite and parallel to each other. The cylinder thoroughfares are of the common three-ported kind, and each cylinder face has fitted upon it a long working slide-valve, having a central exhaust cavity on its inner face, and two duplex thoroughfares passing directly through it, one at each end. Each thoroughfare consists of one passage directly through the valve from back to front at the extreme end, with a secondary branch pas-

sage opening from the back of the valve at a point considerably nearer to the valve's longitudinal centre, and terminating at its other end in the through passage. Hence each of these duplex thoroughfares has two ports on the back and one on the front face of the valve. The valve is worked in the ordinary manner by an eccentric. The four-ported back of the valve is planed true to receive three separate valve-plates, the central one of which is a plain flat traversing slide, disposed upon the blank portion of the valve between the ports, and worked by a common eccentric, so as to govern both the contiguous branch passages of the valve thoroughfares. As adapted to a pair of steam-engine cylinders, the four external ports of the main valve thoroughfares are governed by a set of four adjustable plates, which are perfectly stationary during the regular working of the valves, being only shifted when the cut-off is to be altered. These four plates may be arranged in various ways.

COTTON, W. *Improvements in the manufacture of looped fabrics.* Patent dated October 16, 1855. (No. 2309.)

This invention relates—1. To means for effecting the narrowing or widening for "fashioning" of fabric whilst it is being produced in the machinery employed in the manufacture of knitted or looped fabric. The improvement consists in supporting one or more of the needles at each selvage so as to be capable of traversing with the edges or selvages of the work to narrow or widen such work as desired. Certain of the needles next these selvage needles are withdrawn from continuing to receive loops when the width of the fabric is to be diminished, and are capable of coming in to act with the others next the traversing needle, so as to increase the number of needles for the time to operate when a widening is desired. 2. To forming on the cut edges of looped fabrics selvages of looped work for the purpose of lacing or retaining the otherwise loose threads produced by the cutting. 3. To forming the thickening to the heels of hose, whilst producing such hose on knitting frames, by means of extra threads introduced by guides operated as in warp machines, and to forming, by the use of such guide-thread, selvages to the parts to be cut up for the heel, which improvements are also applicable when other like thickening and tieing in for selvages is desired to be obtained.

CHURCH, W. *An improvement or improvements in the manufacture of ordnance.* Patent dated October 16, 1855. (No. 2310.)

This invention consists—1. Of a method of constructing ordnance by welding together rings of iron and steel. The shape of these rings cannot be explained without engravings. 2. Of a method or methods of lining the interior of ordnance with hardened steel.

WILKINSON, E. *An improved mode of extracting grease from woollen, cotton, and worsted waste.* Patent dated October 16, 1855. (No. 2311.)

This invention consists in the use and employment of mechanical pressure and heat for the purpose named in the title.

FORREST, J. *An improved mode of extracting metals from their ores.* Patent dated October 16, 1855. (No. 2312.)

The patentee reduces the ore to small pieces, and immerses them for a short time in a hot alkaline bath, so that they may absorb a portion of the solution. The broken pieces are then removed from the bath, and subjected to a white heat in a muffle retort, or other suitably constructed furnace. While under this heat the alkali will become fused, and, forming a flux, will facilitate the fusion of the metallic matters contained in the ore, and the separation of the precious metals from their combinations. Another part which this flux plays is to cause the small particles of gold or silver to agglomerate in large beads on the surface of the broken pieces of ore, and thus to prevent loss of the precious metals by sublimation. The ore having been subjected to a white heat sufficiently long to reduce the gold to a pure metallic state, is discharged into cold water, whereby it is rendered very fragile, and capable of being readily reduced to powder. The precious metals may then be separated by any of the ordinary washing or amalgamating processes.

NEWTON, W. E. *Improvements in the construction of fire-arms.* (A communication.) Patent dated October 16, 1855. (No. 2313.)

This invention consists in the use of an adjustable charging chamber in the breech of the gun, and in operating the same by means of a cam and lever in combination, the latter being also used as the trigger guard, so that by throwing the end of it forward it draws down the charging chamber, thereby bringing the latter into the proper position to receive the cartridge from the cartridge chamber or magazine, and by reversing or throwing the end back again to its original position, it raises or readjusts the charging chamber, so as to bring the cartridge on a line with the bore of the gun. In raising the chamber to this position, the back end of the cartridge is cut off and discharged through an opening made in the breech of the gun, leaving the powder exposed to the fuse.

FRASER, J. *An improvement in the manu-*

facture of paper or paper pulp. (A communication.) Patent dated October 16, 1855. (No. 2315.)

This invention relates to a mode of treating straw, grass, hay, &c. These are first cut up into suitable lengths, and then submitted to a solution of soda and lime in boiling water, to which is added common resin. To prepare the solution the patentee dissolves 1 lb. of soda or potash, in two gallons of water; to which he adds, in small quantities at a time, about 1 lb. of common lime; and the liquor is first kept well stirred, and then settled and strained; and to every 100 gallons of clear liquid 2 lbs. of common resin must be added. The mixture should then be boiled again until the resin is dissolved, and the liquor is uniform. Thus prepared, a vat should be about half-filled with the liquor, and as much fibre as the liquor will thoroughly saturate placed in the vat, and completely immersed. The whole should then be boiled three or four hours. The straw is then to be washed with water, and it will be ready to be ground into pulp.

Bessemer, H. *Improvements in the manufacture of anchors.* Patent dated October 17, 1855. (No. 2317.)

The object of this invention is to ensure a union of every part, by forming the anchor in one piece, by founding it in steel or molten scrap or malleable iron.

Clement, J. H. *An improved break for railway carriages, parts of which are applicable to breaks for other purposes.* Patent dated October 17, 1855. (No. 2318.)

These improvements comprise—1. The principle of depressing powerful springs by means of the revolution of wheels, and making available the reaction of these springs by their pressure exerted on breaks to stop the movement. 2. The use of one series of rods running the whole length of the train, capable of revolving by one single effort, and for the purpose of establishing a communication with the waggons that are not armed, "and of putting in motion under those that are armed certain gearing, giving action to the direct agents, or replacing them in their primitive position,"&c.

Bessemer, H. *Improvements in the manufacture of railway bars.* Patent dated October 17, 1855. (No. 2319.)

Claims.—1. The running (while in a fused or fluid state) decarbonized or partially decarbonized iron into a mould, and thereby obtaining an ingot or mass of iron capable of being formed into a rail or railway bar by the process of rolling, and the making from such ingot or mass of malleable metal a rail or railway bar. 2. Melting puddled, or partially decarbonized puddled iron in crucibles, and then casting the same into ingots, for the purpose of forming rails or railway bars by the process of rolling. 3. The melting and casting cemented puddled iron into ingots for the purpose of forming rails or railway bars by the process of rolling.

Bessemer, H. *Improvements in the manufacture of cast-steel.* Patent dated October 17, 1855. (No. 2321.)

The patentee constructs a furnace, having a long rectangular chamber, the mouth of which is on a level with the floor of the foundry, and the sides and ends of which are vertical and parallel to each other, the bottom being formed into an elevated ridge which extends the whole length of the chamber. This ridge is formed by the apex of a pointed arch made below it, and called the cave. Along each side of the furnace there are fire bars, which extend from the lower parts of the ridge for some distance up the vertical sides of the chamber, there being no bars at the bottom of it; the central part of the ridge is flattened, and has formed in it at equal distances several holes, into which the lower ends of the pots or pot-stands are placed. The top of the chamber is covered with large fire-tiles, or with an iron frame, in which fire-bricks are fixed, several openings being left to afford access to the pots. Along one side of the furnace there is a row of square holes leading into a chimney. The patentee prefers skittle pots, with a lid to each, and a tapping hole in the bottom. They should be placed on a stand four or five inches in height, or their lower parts may be elongated so as to form a stand, and fit the holes in the top of the ridge, so that access may be had to the under side of the pots from the cave below. The fuel used should be hard oven coke, supplied from the opening on the upper side of the furnace, and filling up the spaces round the pots, and rising as far as the tops of them. The firebars are below the foundry floor and the air for combustion is supplied from the cave.

Bessemer, H. *Improvements in metal beams, girders, and tension bars, used in the construction of roofs, floors, and other parts of buildings, and in the construction of viaducts, and suspension and other bridges.* Patent dated October 17, 1855. (No. 2323.)

The patentee puts refined or pig iron into a puddling furnace, and there works it in the usual way, but leaves off the operation of puddling before the whole of the carbonaceous matters are driven off; or the metal may be puddled until the whole of the carbon is driven off, and the powdery iron resulting be afterwards converted into steel by cementation. Or the iron may be otherwise decarbonized and reduced to steel. In either case the metal is brought to a complete state of

fusion in pots like those used in the melting of steel. The metal having been melted, he casts it into beams or girders, which are afterwards annealed; but when beams, girders, or tension bars are required of great length, or are to be very light in proportion to their dimensions, he casts the fluid metal in iron ingot moulds and afterwards rolls the ingot to the desired thickness.

WALTON, W. H. *An improved machine for carding, combing, or preparing fibrous substances.* Patent dated October 17, 1855. (No. 2324.)

The principal parts of this machine are the following: 1. Feed boards or aprons with their feed rollers, whereby the fibrous substance is supplied to the machine. 2. Carding cylinders, being rotating cylinders, each clothed with any suitable card clothing, so as to be covered with teeth, which are inclined forwards or in the direction of the cylinder's motion; the fibrous substance is delivered from one of those cylinders to another until it reaches the main carding cylinder. 3. A rotating cylinder called a doffer, also clothed with card clothing, by which the fibrous substance is removed from the main carding cylinder. 4. A comb plate, whereby the fibrous substance is removed from the doffer so as to pass off in the form of a sliver or a mass of straight and parallel fibres.

BESSEMER, H. *Improvements in the manufacture of ordnance, and in the projectiles to be used therewith.* Patent dated October 17, 1855. (No. 2325.)

This invention cannot well be described without reference to engravings.

BESSEMER, H. *Improvements in the manufacture of railway wheels.* Patent dated October 17, 1855. (No. 2327.)

Claims.—1. The casting or founding of railway wheels in decarbonized or malleable iron. 2. The casting or founding of railway wheels in molten steel or decarbonized iron, obtained by decarbonizing crude pig or refined iron until the metal contains no more carbon than is desired. 3. The founding a wheel or part of a wheel of malleable iron or steel without the outer tyre or flange, which may be afterwards fixed thereon, and thus form a complete railway wheel. 4. The forming of the tyres of railway wheels by casting a ring or hoop of malleable iron or of steel, of a sectional form suitable for producing the desired form of tyre by the further process of hammering or rolling. 5. The casting of discs in steel or in malleable or decarbonized iron, and rolling them between plain rollers, and cutting therefrom a loop or ring of the metal, for the purpose of forming a wheel tyre as described. 6. The rolling discs of malleable iron or steel so as to give them a greater thickness towards the central part than at their outer edges, when such discs are used in the manufacture of railway wheels.

PITMAN, J. T. *An improvement in fire-arms.* (A communication.) Patent dated October 17, 1855. (No. 2329.)

This invention relates to the breech of fire-arms, and its principal object is to produce a fire-arm which shall combine facility in loading, efficiency in discharge, safety in using, ease in cleaning, and simplicity in construction. The rifle described consists of a barrel, a stock, a ramrod, and a lock, with the usual guards and trigger. The breech of the barrel is of the faucet variety, and the plug or breech pin is turned to open or close the breech by means of a lever, which shuts down upon the grasp of the stock to close the breech, and turns up to an erect position to open it.

TAYLOR, T. *Improvements in apparatus for extinguishing fire by means of water, part of which is also applicable to governing the discharge of fluids for other purposes.* Patent dated October 17, 1855. (No. 2330.)

This invention relates—1. To the apparatus through which water is discharged, and consists in the adaptation of fixed blades, vanes, or similar parts in front of the orifice thereof, by which means the fluid becomes divided, and is caused to cover a greater area of the ignited surface; and in order to protect such vanes or blades the patentee surrounds them with a trumpet-shaped part. 2. To apparatus for extinguishing fires, and also to ornamental fountains, and other apparatus for spreading the fluid, and consists in the adaptation thereto of blades or vanes caused to revolve, and the revolution is effected by means of the pressure of the fluid as it passes onward to be discharged.

ADCOCK, J. *Improved apparatus for measuring and indicating the distance travelled by ships or other vessels.* Patent dated October 17, 1855. (No. 2331.)

A description of this invention is given on page 535 of this Number.

HARDING, T. R. *Improvements in combs, gills, and hackles used in the preparing and manufacturing of flax, silk, wool, or other fibrous substances, and in combs for combing the human or other hair.* Patent dated October 17, 1855. (No. 2332.)

This invention applies to the construction of gills and hackles, with flattened as well as with round pins or teeth, and admits of the fixing of flattened pins to their bars at as little cost as round pins. The main feature consists in indenting or grooving the face or faces of the bar or strip of metal intended to receive the pins, so that recesses will be provided for the pins, which, when inserted therein, may be secured in position

by soldering, or by mechanical pressure, to the face of the bar.

JONES, C. E. *Certain improvements in machinery for raising water and other liquids, by means of a combination of the principle of the accumulation of force, by compression of air or other elastic fluids, and that of centrifugal force, the more readily to obtain increased mechanical power thereby.* Patent dated October 18, 1855. (No. 2333.)

This invention cannot be described without reference to the drawings.

WAKEFIELD, J. *Improvements in machinery used in the manufacture of screw-blanks, nails, pins, rivets, and other similar articles.* Patent dated October 18, 1855. (No. 2334.)

Claims.—1. The use of adjusting screws or wedges for adjusting accurately the range of motion of the feeding slide of machines used in the manufacture of screw-blanks, nails, pins, rivets, and other similar articles, as described. 2. The use of a relief lever or clutch applied to the feed rod of such machines. 3. The use in such machines of adjustable slides, for affording a nearly continuous bearing for the wire or rod to be made into blanks, and thereby permitting the working up of the ends of the wires or rods. 4. The application of a counter or register of the quantity of articles made to machines used for the manufacture of screw-blanks, nails, and other similar articles.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

MICKLETHWAITE, J. *An improvement in propelling and steering vessels.* Application dated October 15, 1855. (No. 2301.)

This invention consists in propelling vessels by means of air forced against the water. In order to steer vessels, air is forced through a nozzle or pipe, which can be so directed as to turn the vessel as required.

KENT, S. *Improvements in purifying and measuring water, parts of which are applicable to measuring other fluids.* Application dated October 15, 1855. (No. 2303.)

The inventor describes a new apparatus for filtering the water, in its passage from the roofs of houses to the cistern where it is collected for use, and for registering the amount drawn; also certain combinations and arrangements of materials used to form the filtering beds, and a powdered compound for the purpose of softening the water when required.

BENTON, R. *Improvements in obtaining motive power by leverage.* Application dated October 15, 1855. (No. 2304.)

This invention has for its object the means of keeping a barrel or wheel in continuous motion by the successive application of any even number of levers, acting entirely independent of each other, and in eccentric planes.

NORMANDY, L. *Improvements in the mode of writing and printing music, to facilitate the study thereof.* A communication. Application dated October 16, 1855. (No. 2307.)

The inventor makes use of three different colours for the lines or musical scale. For printing, by one operation, the three colours of the scale and the notes of music, three plates in relief are made use of, one for each colour. They are placed one above the other, the upper one bearing the characters and black lines; the two others having lines only which are engaged in narrow clefs of the upper plate, and can be raised over the characters or be withdrawn in order to be inked, each one of a different colour. Then, by a suitable mechanical contrivance, the characters or lines of the three plates are brought to their respective positions to be printed.

CLAEIJS, T. A. *Improvements in the manufacture of corks and bungs.* Application dated October 16, 1855. (No. 2314.)

In this invention the strips of cork are first divided into square rods or parallelopipeds by means of segmental eccentric knives, mounted upon rotating discs, and are next carried to the rounding machine, which gives them the required cylindrical form.

CROSSLEY, W., and S. BEAUMONT. *Improvements in the manufacture of cement.* Application dated October 17, 1855. (No. 2316.)

This invention consists in combining in suitable proportions litharge, red lead, whiting, and sand. These ingredients are ground and mixed together to form a powder, and then mixed with boiled oil to the proper consistency.

THOMSON, W. *Improvements in four-wheeled carriages.* Application dated October 17, 1855. (No. 2320.)

This invention relates to the arrangement of a four-wheeled sleigh dog-cart, so that it can be used either as such or as a sleigh or sledge-bottomed carriage for running over snow and ice.

MACKINLAY, E. *Improvements in reeling apparatus for winding yarn into hanks.* Application dated October 17, 1855. (No. 2322.)

This invention relates to a construction of apparatus rendered automatic to a greater extent than heretofore. In the ordinary reeling apparatus several ends of yarns are wound upon one reel, but in this it is preferred to have a separate reel for each end,

so that when the requirements of one end of yarn call for stopping, the stopping will not affect the entire series of yarn ends. When a certain portion of a yarn end is wound upon the reel, the yarn guide or cop carrier shifts laterally, so as to separate the end or hank of yarn as wound upon the reel into any convenient number of skeins. In ordinary reeling apparatus the required shift is effected by means of a weight and ratchet movement, but in one direction only, the attendant having to shift back the guide for a fresh start for each set of ends. According to this invention, however, this movement is rendered altogether self-acting, and takes place alternately in opposite directions, being effected by means of a ratchet-wheel which is set round a tooth at each revolution of the measuring wheel.

HALCOMBE, J. J. *Improvements in gates.* Application dated October 17, 1855. (No. 2326.)

This invention relates, 1, to rendering gates in some degree self-acting. They are mounted on a central pillar, in the manner of a turnstile. A constant tendency to turn round is maintained by means of a spring acting on the supporting pillar, which is wound up at intervals, or a rope and weight may be used instead of the spring. The invention relates, 2, to the application of a somewhat similar gate to railway crossings.

AYCKBOURN, F. *An improved apparatus for brushing and cleaning of boots, shoes, and trowsers.* Application dated October 17, 1855. (No. 2328.)

For cleaning boots and shoes the inventor employs a framework which supports a spindle, on which are placed one or more sets of concave brushes. A bevelled pulley is placed at one end of the spindle, and the necessary motion obtained by an endless band from the fly-wheel of a steam engine passing round the pulley. A trough containing blacking is placed contiguously to each blacking brush, from which the blacking brush is wetted by means of a small feed brush. For brushing trowsers the brush spindle is furnished with an additional concave brush, and a cylindrical tube is placed inside the leg of the trowsers for the purpose of keeping them extended.

GRAHAM, J. *Improved machinery for cleaning and dressing rice and other grain.* Application dated October 18, 1855. (No. 2338.)

In this improved machinery the grain passes over a succession of continuously rotating millstones, enclosed in a case, and mounted one above the other on a central vertical shaft. The case which encloses the stones it is preferred to make of a conical form, and to construct it of wirework, or perforated metal. The grain in passing from the upper to the lower stones or polishers is conducted to near the centre of the lower stone or polisher by a conical hopper, and it then passes between the top face of that stone and a fixed wire frame, and then between the periphery of the polisher and the case, whence it falls to the next polisher, and so on throughout the series, until it makes its exit from the machine as cleaned or dressed grain. For the purpose of giving the grain a final polish, a disc of cork or wood, covered with sheepskin, is mounted on the same spindle below the dressing surfaces.

PROVISIONAL PROTECTIONS.

Dated April 7, 1856.

836. John Gedge, of Wellington-street south, Strand, Middlesex. Improvements in tiles for buildings. A communication from C. Pandosy.

Dated May 6, 1856.

1062. Obed Blake, of the Thames Plate Glass Works, Blackwall, Middlesex, manager. Improvements in applying practically the principle of internal reflection within transparent substances.

1064. William Joseph Curtis, of Sebbon-street, Islington. Improvements in constructing the permanent ways of railways.

1066. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery for making envelopes. A communication.

1068. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. A method of treating guano and other matters containing uric acid and the manufacture from the products arising from such treatment, as well as from uric acid, of new colouring matters, and the fixing and application thereof. A communication.

Dated May 13, 1856.

1122. Michael Hodge Simpson, of Massachusetts, U. S. Certain new and useful improvements in machinery for combing wool or various other fibrous substances.

1124. Hiram Tucker, of Massachusetts, U. S. An improved spring sacking or foundation for a bed mattress, or other like article.

1126. Charles Boosey, of Holles-street, Cavendish-square. Improvements in music stands for the use of military and other bands. A communication.

1128. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved apparatus for generating illuminating gases from coal or other substances. A communication.

1130. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. The novel application of certain substances to be employed in printing upon woven or other fabrics and paper. A communication.

Dated May 14, 1856.

1132. William Galloway and John Galloway, of Manchester, Lancaster, engineers. Improvements in machinery for rasping, cutting, and chipping dye woods.

1134. Joseph Hadley Riddell, of Sherborne-lane, London, civil engineer. Improvements in stoves or fire-places.

1136. Jerome André Drieu, of Patricroft, near Manchester, Lancaster. Improvements in weaving horse-cloths, blankets, rugs, or similar thick materials.

1138. Uriah Scott, of Camden-town, Middlesex, civil engineer. Improvements in public carriages, and various parts of the same, which parts may be used separately, and applied to vehicles of any description.

1142. Charles Gibson, of Draycott, Derby, gentleman. Improved machinery for the manufacture of bricks, tiles, pipes, and other articles made of clay or plastic materials.

1144. William Horatio Harfield, of Fenchurch-street, London. Improvements in machinery for cutting and smoothing the surfaces of metallic nuts. A communication.

Dated May 15, 1856.

1146. John Cox, of Ivy-bridge Cottage, near Caerleon, Monmouthshire, civil engineer. Improvements in coke and coke ovens.

1147. Robert Walker, of Glasgow, merchant, and Alexander M'Kenzie, also of Glasgow, mechanist. Improvements in electric telegraphs.

1148. William Norris, of Liverpool, Lancaster, anchor manufacturer, and Robert King, of the same place, foreman. Improvements in anchors.

1150. James Leck, of Glasgow, Lanark, N. B., bleacher, and Alexander Miller, of the same place, singer. Improvements in singeing textile fabrics.

1152. Hugh Greaves, of New Palace-yard, Westminster, civil engineer. Improvements in the permanent way of railways.

1153 Charles Richard Williams, of Shiffnal, Salop, farmer. A new or improved implement or apparatus for the cultivation of land.

1154. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improvement in stuffing seats, cushions, furniture, and other similar articles. A communication from P. Touben, of Paris, merchant.

1155. Samuel Weston Moore, of Nottingham, lace manufacturer. Improvements in dividing and finishing lace goods.

1156. William Marychurch, agricultural implement maker, and John Griffiths, engineer, of Haverfordwest, Pembroke. Improvements in horse rakes, part of which is applicable to two wheel carriages.

1157. Matthew Townsend, of Leicester, fancy hosiery manufacturer. Improvements in the manufacture of knitted fabrics.

1158. William Smith, of Salisbury-street, Adelphi, civil engineer. A new application of the syphon as an irrigator, and a motive power machine. A communication from Mons. A. Herault, of Angers, France.

Dated May 16, 1856.

1162. William Henderson, of Dunkeld, Perthshire, gardener. Improvements in the manufacture of brooms.

1164. Andrew Barclay, of Kilmarnock, Ayr, N. B., engineer, and John Wallace, of the same place, gas collector. Improvements in apparatus for the manufacture and measurement of illuminating gas.

Dated May 17, 1856.

1166. Richard Coleman, of Chelmsford, Essex. Improvements in implements for ploughing, hoeing, and scarifying land.

1168. Siegerich Christopher Kreeft, of Fenchurch-street, London, merchant. Improvements in the manufacture of iron and steel. A communication.

1170. Gustav Scheurmann, of Newgate-street, London, music publisher. Improvements in printing music.

1172. Johan Jacob Meyer, of Tatham-street, Molesworth-street, Rochdale, Lancaster. Improvements in machinery for mortising, tenoning, rounding, sweep and straight moulding, boring, grooving, and mitreing.

1174. Charles Titterton, of Roehampton, Surrey. Improvements in the manufacture of zinc and zinc white.

1176. Richard M'Cloy and John Hare, of Glasgow, Lanark, managers. Improvements in spinning and twisting fibrous materials and in the machinery or apparatus employed therein.

1178. George Carter, of Mottingham, Kent, gentleman. Improvements in the mode of propelling and steering vessels, and in the apparatus and machinery applicable thereto.

Dated May 19, 1856.

1180. Jeremiah Brown, of Kingswinford, Stafford, machinist. New or improved machinery to be used in the manufacture of iron.

1182. George Clark, of Great Cambridge-street, Hackney-road, Middlesex, gas engineer. Improvements in the manufacture of illuminating gas.

1184. John Kinnersley Smythies, Kensington-park-gardens. Improvements in apparatus or instruments for ascertaining the points of the compass, and the latitude and longitude of a place.

NOTICE OF APPLICATION FOR PROLONGATION OF PATENT.

A petition is to be presented to Her Majesty in Council by Thomas Cardwell, of Bombay, in the East Indies, merchant, now of Manchester, for a prolongation of the Letters Patent for England, granted to him December 15, 1842, and of Letters Patent for Scotland, granted to him December 9, 1842, for "Improvements in the construction of presses for compressing cotton and other articles."

On the 5th July next, or on the next day of sitting of the Judicial Committee of the Privy Council, if it do not sit on the day mentioned, an application will be made to that Committee to fix an early day for hearing the matters contained in the said petition; and any person desirous of being heard in opposition must enter a caveat to that effect in the Privy Council Office, on or before the 5th July next.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," June 3rd,* 1856.)

189. Charles Rothwell. Improvements in self-acting mules.

213. Patrick Doran. Improvements in pneumatic apparatus for raising sunken vessels or other bodies under water, and for keeping afloat vessels or other bodies liable to sink.

218. William Beasley. Improvements in machinery or apparatus to be employed in rifling the barrels of fire-arms and ordnance.

227. Pierre Emmanuel Guérinot. Stopping instantaneously two railway trains running against each other.

235. William John Simons. An improved governor for steam and other engines requiring governors.

246. Auguste Mathieu Maurice De Bergevin. Improvements in preparing coal for burning, and in the furnaces employed in consuming such coal.

247. Robert Walter Winfield. An improvement or improvements in the manufacture of metallic bedsteads and other articles of metallic furniture.

253. Thomas Fewster Wilkinson. Improvements in reaping and mowing machines.
254. John Lee Stevens. Improvements in doors or apparatus for regulating the supply of air to steam boiler and other flues and furnaces.
277. Peter Armand Lecomte de Fontainemoreau. Certain improvements in the saponification of fatty matters.
281. Henry Bestwick and Joseph Bury. Certain improvements in cocks, taps, or valves.
283. James Timmins Chance. Improvements in furnaces used for flattening glass.
295. Alexandre Tolhausen. Certain improvements in machinery for picking carding, and combing fibrous substances. A communication.
343. John Elce and Samuel Fletcher Cottam. An improved mode of lubricating the spindles of machinery used in preparing and spinning cotton and other fibrous materials revolving in a lifting rail.
372. Henry Fort Mitchell, William Mitchell, and John Clarkson. Improvements in sewing machines.
427. James Knowles. Improvements in the construction of metallic pistons.
466 Thomas Goode Messenger. Improvements in boilers.
488. George Coates. Improvements in partitions or brattices for coal mines and other underground works.
493. Francis Thompson. An improvement in skates.
598. Robert Maynard. Improvements in machinery for cutting and separating agricultural produce.
611. Grand de Chateauneuf. A hydropneumometric gas meter.
833. Frederick George Underhay. Improvements in apparatus for drawing off water.
903. William Routledge. Improvements in the construction of steam engine and other boilers to prevent explosions.
950. Jules Dortet. An improved padlock.
1065. William Edward Newton. Improved apparatus for connecting boats with their tackle, and clearing or detaching them therefrom when lowered from on board ship into the water. A communication.
1066. William Edward Newton. Improved machinery for making envelopes A communication.
1068. Richard Archibald Brooman. A method of treating guano and other matters containing uric acid and the manufacture from the products arising from such treatment as well as from uric acid, of new colouring matters, and the fixing and application thereof. A communication.
1102. Richard Archibald Brooman. An improvement in cranes. A communication.
1116. Richard Whytock. Improvements in apparatus to facilitate the printing of yarns or threads.
1122. Michael Hodge Simpson. Certain new and useful improvements in machinery for combing wool or various other fibrous substances.
1124. Hiram Tucker. An improved spring sacking or foundation for a bed mattress, or other like article.
1125. Alexander Parkes. An improvement in preparing materials for and in waterproofing and coating woven and other fabrics, paper, leather, and other substances.
1136. Jerome André Drieu. Improvements in weaving horse-cloths, blankets, rugs, or similar thick materials.
1143. William Crofts. Improvements in the manufacture of lace and other weavings.
1144. William Horatio Harfield. Improvements in machinery for cutting and smoothing the surfaces of metallic nuts. A communication.
1153. Samuel Weston Moore. Improvements in dividing and finishing lace goods.
1162. William Henderson. Improvements in the manufacture of brooms.
1170. Gustav Scheurmann. Improvements in printing music.
1176. Richard M'Cloy and John Hare. Improvements in spinning and twisting fibrous materials, and in the machinery or apparatus employed therein.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

1853.

1310. William Henry Bentley.
1318. Daniel Bateman.
1321. Edward Duclos De Boussois.
1340. Edward Wilkins.
1347. Admiral the Earl of Dundonald.
1351. John Robert Johnson.
1360. William Edward Newton.
1369. James Hayes.
1420. Samuel Frankham.
1662. Abraham Walker Craig, Daniel Foster, and Thomas Valentine.

LIST OF SEALED PATENTS.

Sealed May 27, 1856.

2698. George North.
2745. Arthur Paget.
2774. John Radcliffe and Thomas Vickers Favell.
2781. James Cocker.
2832. Thomas Warren.
2843. Samuel Fletcher Cottam.
2848. Omrod Coffeen Evans.
2909. James Chesterman.
15. Charles Toye.
19. James Bagster Lyall.
90. Emile Constantin Fritz Santelet.
106. William Owen.
276. Charles Robert Moate.
318. James Howard.
355. Thomas Steven.
502. William Exall.
571. The Chevalier Guillaume Hahner
686. John Juckes.

Sealed May 30, 1856.

2730. John Marsh.
2731. Adam Bullough.
2740. Alfred Vincent Newton.
2742. Charles Hawker and Thomas Parry Hawker.
2744. William Mosley.
2766. John Allin Williams.

2786. Richard Archibald Brooman.
2811. Richard Holben.
2857. William Wilkinson.
2888. Jean Baptiste Emile Saffroy.
2895. Edward Tyer.
108. Joseph Hostage, Thomas Ives Brayne Hostage, and John Tatlock.
342. Charles Swan and George Frederick Swan.
558. Charles Morgan and Charles Ranken Vickerman.
628. Joseph Dumas.
666. John Watson Burton and George Pye.
706. John Henry Johnson.
708. George Hallen Cottam and Henry Richard Cottam.
709. James Hargraves.
726. William Edward Newton.
751. Alfred Vincent Newton.
799. Henry George Hine.

Sealed, June 3, 1856.

2732. John Moffat.
2733. William George Plunkett and John Bower.
2734. William Nunn.
2735. Thomas Mara Fell.
2737. Cæsar Heilmann.
2754. Thomas Russell Crampton.
2755. Angier March Perkins.
2757. Angier March Perkins.
2762. James Gardner, Henry Gardner and John Carey Gardner.
2764. Charles Lenny.
2768. Henry Bessemer.
2778. Andrew Maclure.
2782. Thomas Heppleston and John Hunter.
2794. Alexandre Tolhausen.
2804. Rogers Ruding.
2805. Robert W. Davis and Daniel Davis.
2810. William Leighton.
2859. Alexandre Tolhausen.
2876. Robert Walker.
2896. Henry Francis.
2898. William Joseph Curtis.
2902. John Henry Johnson.
2904. Christopher Dresser.
2906. Edward Rowcliffe.
2918. Alexandre Tolhausen.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

CONTENTS OF THIS NUMBER.

Belleville's Smokeless Furnaces (*with engravings*) 529
Faraday's Researches in Electricity (*concluded from page* 461) 530
Sir James South and the Royal and Royal Astronomical Societies (*concluded from page* 487) 532
Adcock's Marine Odometer 535
Harvey's Apparatus for Removing Hanks from Reels (*with engravings*) 536
A New Weighing Instrument 537
The Railways and the Post-Office 537
Merchant Shipping Registration Act 537
Woodcock and Gardner's Patent Furnaces 542
Mechanical Locomotion 542
Specifications of Patents recently Filed:
Dodds ..... Fire-arms & Ordnance 544
Brown and Brown Folding Chairs 544
Negretti & Zambra Thermometers, &c. 544
Thomson ..... Steam Engines 544
Cotton ..... Looped Fabrics 545
Church ..... Ordnance 545
Wilkinson ..... Cleaning Woollen Waste 545
Forrest ..... Separating Metals 545
Newton ..... Fire-arms 545
Fraser ..... Paper 545
Bessemer ..... Anchors 546
Clement ..... Railway Break 546
Bessemer ..... Railway Bars 546
Bessemer ..... Cast Steel 546
Bessemer ..... Metal Beams, Girders, &c. 546
Walton ..... Carding Machine 547
Bessemer ..... Ordnance and Projectiles 547
Bessemer ..... Railway Wheels 547
Pitman ..... Fire-arms 547
Taylor ..... Extinguishing Fires 547
Adcock ..... Marine Odometer 547
Harding ..... Combs, Gills, and Hackles 547
Jones ..... Raising Fluids 548
Wakefield ..... Screw-blanks, &c. 548
Provisional Specifications not Proceeded with:
Micklethwaite ..... Propelling and Steering Vessels 548
Kent ..... Purifying Water 548
Benton ..... Motive Power 548
Normandy ..... Writing Music 548
Claeijs ..... Corks and Bungs 548
Crossley and Beaumont ..... Cement 548
Thomson ..... Carriages 548
Mackinlay ..... Reeling Apparatus 548
Halcombe ..... Gates 549
Ayckbourn ..... Cleaning Boots 549
Graham ..... Dressing Grain 549
Provisional Protections 549
Notice of Application for Prolongation of Patent 550
Notices of Intention to Proceed 550
Patents on which the Third Year's Stamp-Duty has been Paid 551
List of Sealed Patents 551

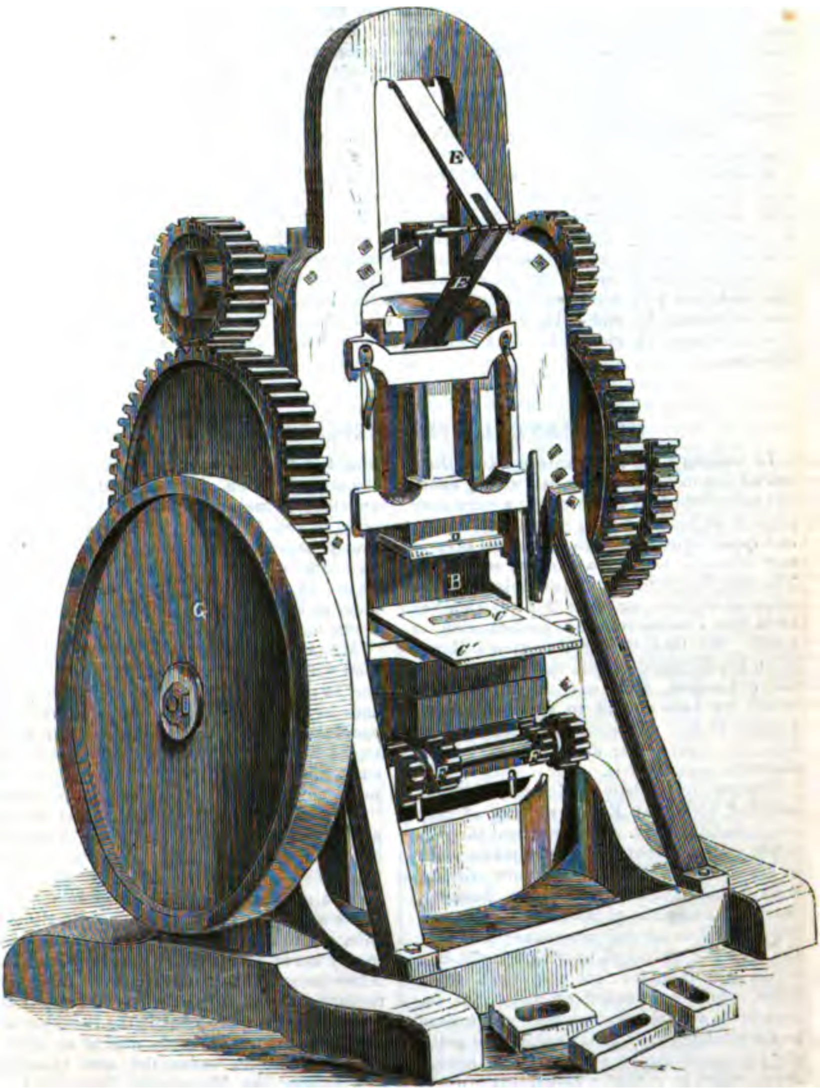
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1714.] SATURDAY, JUNE 14, 1856. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

AMERICAN MACHINE FOR MAKING HOLLOW BRICKS.



AMERICAN MACHINE FOR MAKING HOLLOW BRICKS.

The improvement illustrated by the accompanying engraving (on the preceding page) is a machine for forming and pressing what are known as "hollow bricks." These consist of bricks made of the usual materials and in the common form, but with an oblong aperture pressed through their centres. Specimens are shown in the engraving at the foot of the machine.

In the present machine the clay out of which the bricks are formed is placed in the hopper, A, whence it falls into the movable box, B; the latter has a reciprocating movement, and alternately comes forward over the mould, C, and then returns back to the position seen in the cut. Box B has an open bottom, and slides on the table, C'; when, therefore, box B comes forward, some of the clay contained within falls into and fills mould, C; the box then returns beneath hopper, A, and receives a new load of clay, while the plunger, D, comes down and presses the clay into the mould, C, with tremendous force. Plunger D is attached to a frame, which moves up and down in the frame of the machine; the plunger frame is operated, as will be seen, by the toggle joint levers, E, which, in their turn, are connected by pitman and crank to the driving part of the machine. The brick is thus pressed with great power.

Within the mould, C, there is another plunger, (not shown) which, at the proper moment rises, and throws up the pressed brick level with table, C', so that it can be removed. This secondary plunger is operated by pinions, F F, which move suitable racks. Motion is communicated to the machine through band wheel G, the various parts being connected and made to operate at the proper instant by means of gearing and other devices.

This machine is simple, strong, operates with great rapidity, is very convenient, presses the brick in a very direct and sure manner, leaves all the edges sharp, &c. It is the invention of Messrs. M. and J. H. Buck and Co., of Lebanon, N. H., from whom further information can be obtained. Measures have been taken to secure a patent.—*Scientific American.*

MERCHANT SHIPPING REGISTRATION ACT.

In making a few comments on Mr. Atherton's letter in our last Number, we beg again to assure him that we entertain a very deep respect for his honesty of purpose, integrity, and capabilities, although we cannot give in our adhesion to all that he has written on Tonnage Registration. Our object in the remarks we have made on this question has been the elucidation and confirmation of truth. We took up Mr. Atherton's Essay in no hostile spirit—quite the contrary; but felt compelled, from our convictions (for which we have a right to claim as much honesty as Mr. Atherton would demand for his), to express our dissent from a considerable portion of it.

Comparing the letter which we last week inserted with that Essay, we cannot help congratulating Mr. Atherton upon the manifest improvement which has taken place in his opinions, although they are still far from being faultless. We have, however, reason to complain of his mode of expressing himself on several occasions; probably the meaning conveyed to others is not that which was intended, but the effect is the same, whether intended or not. For instance, we are told that we are "*constrained* to acknowledge, and at the same time palliate the insufficiency of the law of 1854." Now, what is it that "constrains" us to offer any opinion? Mr. Atherton's words would imply that we have put ourselves into the attitude of an advocate, and that we are *unwilling* to make any admission that might seem to tell for him. This is a "gratuitously assumed conclusion" on his part; and if he wishes credit for honesty—which we are by no means inclined to refuse—we may, as we have said, at least claim equal credit for it ourselves.

Mr. Atherton complains that we, in common with many others, have misunderstood, and so misstated, the purpose of his paper, and have consequently attributed to him conclusions which he disavows. If this be so, he has no one to thank but himself for such misconceptions. For instance, it appears now that he had no fault to find with "internal roomage" as one element of registration, and still less with the "*mode*" of measurement which he regards as a mere "question of detail;" although he does entertain an opinion with regard to the relative merits of Mr. Peake's and Sterling's rule, about which we shall have something to say hereafter. Our notion of what Mr. Atherton meant was derived from such paragraphs as the following:—"In the first place, let us inquire what is the meaning of the term *tonnage*, as made use of in shipping registration under the now existing law, namely, the Mercantile Shipping Act of 1854? what matter of fact or measurable

realities does the term tonnage signify? has the *tonnage* of a ship any specific relation either to the displacement of the ship or the nett tons' weight of cargo the ship will carry, or the quantity of cargo a ship will hold? does the registered *tonnage* correctly answer any purpose as the base of calculation in commerce, *or as preventing fiscal* imposition? does it equitably constitute the base of building contracts? or answer any useful purpose in scientific inquiry, as affording elementary data available for determining the relative locomotive merits of ships? Finally, does the registration of *tonnage*, under the existing law, afford any information whereby cupidity and recklessness in the loading of ships can be officially exposed or checked in a manner conducive to the safety of property and life? Such are the points which we purpose inquiring into; and if the present system of tonnage registration does not fulfil these requirements, it is purposed to submit to the consideration of the Society of Arts such suggestions as may conduce to the attainment of these objects."

We need scarcely observe that the paper consists in proving that the "present system" does NOT fulfil these requirements, and suggestions are offered accordingly. As regards the *mode* of measurement again, which we are now told is a mere matter of detail, our readers shall hear what Mr. Atherton has to say in the following passage, almost before he has fairly entered on his subject, and judge whether we have misstated him. "Under this Act of 1854, a system of tonnage admeasurement, based on internal capacity, but reduced by a factor (divisor 100), in order that the aggregate of tonnage, as measured by this new law, might correspond with the aggregate, if measured by the old law, has now become the law of the land; and *although* this commission commenced its labours under the avowed and recorded declaration, "that it is desirable to establish an easy practical mode of admeasurement," the specification merely of the outline of the system of admeasurement, as prescribed by the Bill of 1854, occupies no less than ten clauses in the Act; and the detail of working out the calculations, to be properly understood and not done by rote, demands a course of laborious mathematical study. This system being merely the application of mathematical routine to the curvature of bodies, its accuracy may be admitted; but the prescribed detail of instructions to meet various sizes of ships and various peculiarities of construction have been made so multifarious as to complicate the application of the system, and to render the practical operation whereby the results are obtained a mystery, unintelligible to everybody excepting those who make it a professional study."

Pretty plain speaking this; and yet Mr. Atherton is astonished that Mr. Moorsom (not we) designated his paper a "condemnatory harangue."

Again: "The inveteracy of blind habit cannot be better illustrated than by the fact that the old rule for calculating tonnage, without reference either to depth of hold or draught of water, withstood the declared condemnation of several successive Parliamentary commissions, and continues to be pertinaciously made use of to regulate ship-building contracts, and the purchasing of ships in mercantile dealings, and even by Government authorities, though legally superseded in 1854 by Act 5 and 6 William IV., c. 56, which thus twenty years ago prescribed and legalised a totally new system of tonnage admeasurement based on ordinates, as hereinbefore referred to, which system failed to be popularly adopted on account of its complication; but nevertheless a far more complicated extension of the same system has now been introduced by the Merchant Shipping Bill of 1854. . . Popular education has doubtless of late years made great progress; but still we have scarcely arrived at such a state of proficiency as to render it advisable that our tonnage admeasurement, so constantly put in requisition by every merchant, should be the solution of the mathematical problem for the *reduction of parallelopipedons by rectangular co-ordinates*. Were the new measurement of 1854 honestly called by this its proper name, it would not be listened to for one moment; the very name would expose it; but, instead of being thus designated, it is called Sterling's simple and easy system of admeasurement. Undoubtedly Sterling's reduction of parallelopipedons by rectangular co-ordinates, like the calculation of eclipses, may be simple and easy to those who perfectly understand it, but a mystery to those who do not, and very likely to be bungled by those who attempt to apply it in ignorance of the principles involved."

Such was Mr. Atherton's "declared condemnation" of Sterling's rule on the 16th of January. On the 27th of May the same gentleman considers "the *mode* of measurement a question of detail." He has "no desire to depreciate Sterling's rule," and is surprised at our directing so much of our reader's attention to it. We congratulate him on his change of opinion, but we really must demur to his including this among the "gratuitously assumed conclusions" which it appears we have been pleased to represent as the purport of his paper, and have so misstated his case.

As regards his imputed attack on the

shipping interests, we have already expressed our opinion that he intended no serious charge against them. He now denies that his words are capable of any such construction, and we do not doubt his sincerity in this declaration. Mr. Atherton, however, must have far less experience in the ways of the world than we give him credit for, if he is unaware that far more serious damage can be done to a reputation by an apt introduction of it into the company of characters about which there can be no mistake, than by any direct imputation. And we must say, that when, *à propos* to the subject of registration, *boroughmongering*, opposition to free trade, fraudulent declarations of dividends, to say nothing of the imputed corrupt resistance to reform by the professions of law, physic, and divinity, are brought upon the *tapis*, the shipping interests, who are not conscious of their imputed short coming, naturally feel aggrieved at being placed in such questionable, or rather unquestionable company. It is more in what is implied than in what is decidedly said, that the "insult" was felt to consist. However, with the ample explanations of Mr. Atherton, the parties concerned would be unreasonable not to be satisfied.

Our remarks, be it observed, went only to the point, that the necessity and the advantage to the public of a change of registration had not been established on such reasonable grounds as to afford any parallel between the shipping interests and other notoriously corrupt bodies declining to petition for their own reform. But is it not assumed that this necessity and advantage have been incontestably established in the whole paragraph complained of—especially in the peroration?—"What right or reason, then, have we to expect that the shipping interests will voluntarily petition the legislature for an effective system of registration, *throwing open the mysteries of their craft with a view to the public good?*"

Then, again, Mr. Atherton hardly states the case fairly, when, in disavowing the conclusions which have been erroneously attributed to him, he says, "For instance, by my paper I did not object to internal roomage as one element of tonnage registration; but I upheld it as indispensable to a complete system of registration."

To state the case fairly, Mr. Atherton ought to have told us the *relative importance* of the registration of the "internal roomage" as at present by law established, and as it would be in accordance with his own suggestions. By the Law of 1854, the internal roomage, divided by 100, constitutes the tonnage of the ship on which "harbour dues, pilotage, light dues, and the like are to be assessed." According to the proposed system, the registration of "internal roomage" is of very minor importance, and might be entirely omitted with little or no inconvenience. It would scarcely be missed. Mr. Atherton suggests in his paper, that the "'builders' measurement,' which is also to indicate the size of the ship on which the various dues are to be assessed, should be determined by taking the product of the external length and breadth as measured at the regulation deep draught water-line multiplied by the *internal* depth of the hold, and divided by 100," corrected by a suitable factor, "according as the intended ship may be proposed to be built with full lines burdensome for cargo, or finer lines more adapted to speed." The *main* issue, therefore, is necessarily raised between these two measurements—for *fiscal* purposes: and as the greater part of Mr. Atherton's paper is directed against the established measurement as *suitable for this purpose*, we do not think that gentleman has much reason to complain of "gratuitously assumed conclusions" on our part, or of the term "condemnatory harangue" against the Merchant Shipping Law of 1854, applied to his paper by Mr. Moorsom.

Any one perusing his letter in our last number, and not well-acquainted with his original paper of January 16th, would go away with the impression that he left internal measurement to perform pretty much the same functions as at present, only suggesting other matters "in addition." Whereas the real question is the much-vexed question between *external* and *internal* measurement as the basis for levying light and other dues!

By-the-bye, as Mr. Atherton is so exacting in his requirement that the term tonnage, as made use of in shipping registration, (and he will scarcely deny that levying dues is one of its principal uses,) should "signify" some "matter of fact or measurable *reality*;" what "matter of fact or measurable reality," we may, in our turn, inquire, does the proposed builders' measurement represent, "having *two external* elements, and one *internal*?

As for the *admissions* which it seems we have made, of which Mr. Atherton certainly is not inclined to throw away the benefit, we really went further than he states; we allowed that the present mode of measurement was only the *second best* resource of the Government, who had been foiled in their attempt to legalize an equitable system of external measurement. They fall, however, very far short of an admission of all the "grounds on which 'Coryphæus' the agitator based his 'condemnatory harangue.'" That worthy gentleman must

have strangely forgotten his own paper—or must give credit to others for a very short memory—or he would tell our readers that the assumed encouragement to shipowners to dangerously overload their vessels held out by the present registration was one only among many other grounds on which his "condemnatory harangue" was based. We have, for instance, first of all the "complication" of the rule itself, which was stated to be unintelligible to all but professional persons, and such as to render its application abortive; this, too, subsequently enlarged upon as we have already shown. Next we had the "assumed" misapplication of the term "tonnage" as applied to "roomage" and not to "weight" or burden. Thirdly, the assumed insufficiency of the guarantee given by the new rule, or "inducement to builders tending to improvement in the form or build of shipping." Fourthly, its incompetency to afford data for the comparison of the *locomotive* merits of ships—to say nothing of an "assumed" ambiguity in the term tonnage itself as defined by law, which we showed to be a mere creation of Mr. Atherton's brain. All these points were jointly and severally, and "verbosely," aye, verbosely, descanted on, as most cogent reasons for substituting Mr. Atherton's propositions for the present law, which, if we are not egregiously mistaken, was the true purport of his paper. He now, however, limits his observations to one only of these points, viz., the encouragement given to the dangerous overloading of ships, on which ground, in consequence of our admissions, he thinks himself safe.

He joins issue with us on our statement, that a vessel of 1000 registered tonnage may safely be considered by the owner to be capable of bearing 1,000 tons weight. This he answers by an "assertion," of the truth of which he gives us no means of judging, that the safe loading of two ships of the same nominal tonnage may vary in the proportion of 30 to 5, and that while one vessel of 1,000 tons may safely carry 1,500 tons' weight of cargo, and in addition 1,500 tons by measurement of light cargo—in all 3,000 tons—another may safely carry only 500 tons weight. We may well let this assertion go for what it is worth; for our part, until we have some data in its favour to rely upon, we withhold our assent.

A vessel of 1,000 registered tonnage has an *internal* capacity of 100,000 cubic feet. 1,500 *tons weight* of cargo represents a displacement of 52,500 cubic feet of water; and 15,000 tons of light cargo at 40 feet to the ton, represents a displacement also of 52,500 cubic feet; so that the whole displacement of such a vessel between the light and load draughts is 105,000 cubic feet — 5,000 feet more than its internal measurement! To this we must make a considerable addition for the light displacement. The vessel in question must, therefore, have an *enormous difference* between its external and internal measurement — an unheard-of thickness of scantling to carry so much weight, and that, too, at a safe distance below the deck! The other poor ship, which may carry 500 tons *weight*, is limited to a difference of displacement of 17,500 cubit feet; and yet their internal space is the same! *Credat Judæus!* Now, we have asserted that a ship of 1,000 nominal tonnage may be fairly reckoned upon for carrying 1,000 *tons weight* of goods. This is allowing only 35,000 cubic feet of sea-water for the displacement of such a vessel between the load and light draughts! This is so much within bounds that we might safely have ventured upon a higher figure.

Mr. Atherton has made up his mind, however—in spite of the admissions of all men practically interested in this matter, that the present law does afford a fair basis for levying tolls—that this shall only be done at the price of safety. Nothing, then, will serve him but to represent our "ships as sunk or water-logged, deck awash, full it may be of dead men's bones," in order to secure equity in levying tolls — a precious condition of things indeed! which may be applicable enough for his model ship of 1,000 nominal, but 3,000 real tonnage, but which we utterly repudiate.

It does not seem to have struck Mr. Atherton that possibly, without sinking ships, there may be a *tolerably fair* proportion between the whole internal measurement and the displacement when fully loaded, not varying for different ships so much as 5 or even 2½ per cent.—the nearest approximation to correctness which he himself aims at.

Now with regard to fixing the load waterline, we are told that hundreds of ships are instanced by Fincham in which the limit of draught or load-line, as proposed by the constructor, is specified and recorded in feet and inches as the contemplated limit of loading. Granted. A large proportion of these ships, unless our memory fails us, are vessels of war. Now we speak under correction, for we cannot expect to have the same information on this point as a Government officer, whose duties necessarily make him acquainted with these matters; but we are under the impression that the fixing of the load water-line is necessary in ships of war, not so much to create a limit for the safe loading, as to keep the batteries at a proper distance above the water. We have heard it whispered—we still speak under

correction—that it was not at all an uncommon thing, in the reign of the late surveyor of the navy, to hear of vessels constructed for a definite load-draught being immersed several feet beyond, and yet no danger, or suspicion of danger, to the *safety* of the ship resulted.

In the case of merchant vessels, the constructor doubtless would consider that the ship, if immersed only as far as his proposed deep-draught water-line, would display her good qualities in the highest degree; but we question whether he would presume to say that it would be *dangerous* to load her more deeply. Indeed, we question whether it would be an easy matter to find a constructor who would take on his shoulders the responsibility of fixing such a limit. At all events we believe we are right in asserting that no such quality is now attached to the constructor's load water-line. That the *difficulty* (we do not say impossibility) of fixing a limit to the safe immersion of ships is real, and not entirely attributable to "the cupidity of ship-owners and ship-charterers," Mr. Atherton might have satisfied himself by the reflection, that after all his inquiry and research, he is unable to suggest any nearer limit than one-*fourth*, or one-*fifth*, or one-*sixth* of the beam below the deck. We are left in a state of uncertainty whether in all cases the distance is proposed to be some *one* of these proportions, to be settled by "consultative deliberation," or whether all these are to be used according to circumstances. One would imagine, however, that a *long* ship, with comparatively small breadth, would, for safety require the *water*-line at a greater distance below the deck than a shorter ship with a fuller beam. Mr. Atherton's suggestion, if adopted, would give exactly the opposite result.

We repeat, we only instance this to show how difficult it must be to fix this line, since such is the only suggestion that has occurred to the mind of Mr. Atherton, who is giving anxious attention to the whole question.

As regards the operation of the new law, Mr. Atherton has not touched the real point at issue. We maintain that the duty of government is to levy its tolls on vessels fairly, without giving an undue preference to any particular type of build. This is unquestionably done by the new system of basing these payments on the *actual internal measurement*. Whether a ship is built "with full lines burdensome for cargo, or with finer lines more adapted for speed," its *exact* internal measurement is taken as the basis of levying the payments: and a builder or owner is therefore not obliged to think of anything but the form most suitable for his own purposes, in order to meet the requirements of the law. This surely is as much as can fairly be demanded.

We have now briefly discussed the principal points brought forward in Mr. Atherton's letter occasioned by our review; and again we congratulate him—on comparison of this with his former "recorded" view—on the important modifications which have taken place in his opinions, which leave us room to hope that he may ultimately return to a sound state of mind on tonnage admeasurement.

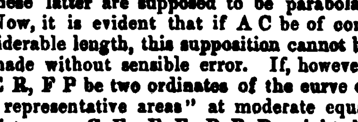
Our readers will remember how anxious Mr. Atherton was, that our note on tonnage measurement should be republished with all the corrections which had unfortunately been rendered necessary by its accidental admission without a final editorial revision. We, and probably our readers, expected some strictures on it. We are, however, gratified to find, that Mr. Atherton can find nothing to say against it. He qualifies this tacit approbation, however, by a comparison of it with "Mr. Peake's system," which we are told deserves the preference, "on the score of superior applicability and facility of being mentally understood by the operator," and that it includes a closely approximate measurement of the curved spaces, whether convex or concave; whereas, by Sterling's rule, "no notice whatever is taken of the curved portions above referred to; Peake's system is therefore the more correct of the two."

Now we do most sincerely trust that Mr. Atherton has formed his judgment on other questions brought prominently before the public in his paper, and his subsequent additions to it, on more reliable data, than he has brought to bear on this subject. We assert—and are ready to prove if necessary—that Sterling's rule is applicable to the measurement of the curved spaces, whether convex or concave, by which the real form of a ship between the extremities of the ordinates of measurement differs from a straight line; and that, taking notice of these portions of the ship is by no means a peculiarity of "Mr. Peake's system." We presume that the curve of sections, as explained in Mr. Peake's little work in Weale's Rudimentary Series, published in 1849, is that alluded to. At all events, we do not know of any other publication of his which contains a more elaborate exposition of his "system," or a different "system." For a complete elucidation of this mode of measurement, we refer our readers to p. 15, of the little work referred to.

After the statements of Mr. Atherton, our readers will be surprised to hear that Mr. Peake divides the length of his ship

into a definite number of *equal* parts, as usual, and takes the vertical sections at each of the points of the division, *the areas of which he calculates strictly in accordance with the received rule.* It is here that the divergence from the usual method takes place. He takes a base line, which he lays down to a certain scale, to denote the length of the ship, and at each point of division sets off lines at right angles to this to a fixed scale, proportional to, and therefore representative of, the areas; and through the extremities of these ordinates he draws a curve, which is the curve of sections. Now, with all this, we find no fault whatever. On the contrary, the representation of the solid contents of the ship by means of this curve is attended with several advantages. But the method by which that measurement is effected cannot so unreservedly meet with our approbation. The length being divided into two equal parts, and the ordinate to the curve drawn at the middle point, by joining the extremity of this ordinate with each extremity of the length, the figure is divided into two equal triangles, and two areas contained between the curve of sections and the chords before drawn. These two curvilinear areas are considered as portions of common parabolas, and so the calculation is effected.

According to Sterling's rule, the curves drawn through the extremities of each of three consecutive ordinates is a parabola, which evidently gives a closer approximation than Mr. Peake's rule. Thus, if A B be the length, C its middle point, and C D proportionate to the area of the section at C, A P D Q B the curve of sections, the area A B D is divided by A D, B D, into



two equal triangles, A C D, B C D, and two curvilinear areas, A P D, D Q B; these latter are supposed to be parabolas. Now, it is evident that if A C be of considerable length, this supposition cannot be made without sensible error. If, however, E R, F P be two ordinates of the curve or "representative areas" at moderate equal distances, C E, E F, P R D might be taken, without sensible error, to be a parabola; and so for other portions. Peake's method of curves of sections, so far as any peculiarity in the measurement goes, is therefore decidedly *less correct* than Sterling's rule. The independent measurement of the appendages, as they are called, *i. e.* those portions of the vessel (as part of the stem, stern-post, and keel) which are not bounded by curves, belongs to no rule in particular.

Unless, therefore, we are grievously misinformed with respect to Mr. Peake's curve of sections, nothing can be more opposite to the truth than Mr. Atherton's ascription to the measurements made by means of it, as proposed by Mr. Peake, of the advantages of superior accuracy, applicability, and intelligibility. On the contrary, when the operator has once become familiar with the mode of calculating an area (which he has to do for all the sectional areas on Mr. Peake's method), all he has to do by Sterling's rule, is to apply this same method for the summation of the areas to obtain the cubic contents; whereas Mr. Peake requires him to lay off the representative areas accurately to a scale, to draw a fair curve through them, and then to obtain the greatest distance between the two chords and the curve by trial; and all this to result in a measurement decidedly less accurate than would be obtained by following the usual rule.

If we are mistaken in Mr. Peake's method, we shall be glad to have our error pointed out; but this is certainly what we gather from his little book in Weale's Series.

ON LARGE BELLS AND BELL MACHINERY.

(*Continued from page 509.*)

Resumed Discussion at the Ordinary General Meeting of the Royal Institute of British Architects, Feb. 11th, 1856.

I do not participate, continued Mr. Baker, in the fears expressed by some gentlemen that one bolt would not stand the strains of a heavy bell in a state of oscillation; whatever the strains may be, it is evidently quite possible to make the bolt strong enough to resist them, and the sufficiency of a single bolt is still more obvious in the case of bells that are to remain stationary, like those intended for the clock tower of the Palace of Westminster. Hung in this manner, such bells could be frequently and easily turned round their vertical axes, and the wear occasioned by their enormous clappers and hammers spread round their sound bows. If the fourteen ton Westminster bell is hung in the manner shown on the drawing now exhibited by Mr. Denison,* it

* See illustration given on page 465.

will be a much more difficult matter to turn it about its vertical axis than is perhaps at all contemplated. It is ridiculous to suppose that such a bell can be slewed simply by the hands of a few men. In order to accomplish this operation, a quantity of tackle, screw jacks, and in all probability, planks and staging will be necessary; and taking into account the time and labour requisite to hoist these to the top of a very high tower, to move the bell, and then to remove and lower the tools, tackle, &c., we shall find the operation, under the most favourable circumstances, attended with very considerable expense. It would be much better to slew a bell once every six months than once in ten years as has been proposed, and a fourteen ton bell might be fitted with a permanent apparatus for doing this, without interfering with or stopping the striking of the clock, for much less money than it would take to move the bell once without it.

It was mentioned by Mr. Ashpitel in the discussion last year, that "he had observed at Rome that the clapper was hung so as to have some play round the sound-bow, and not to strike always on the same point." I have observed the same thing myself in foreign bells, but it would not do for the clappers of a peal of bells to have any lateral motion, because they would not then clapper with any degree of accuracy. I have recently been very positively informed that in breaking up old bells for recasting, it is frequently discovered that they have been cracked in the crown by the oxidation of the piece of iron cast in them, from which the clapper is suspended. A bell cast on my plan would never thus become cracked.

Mr. R. C. Nichols, visitor, read a paper containing some investigations into the nature and amount of the dynamical forces arising during the motion of a large bell, and proceeded to explain the formulæ which he had obtained for the direct strain* upon the bolt or bolts supporting a bell in motion; the vertical thrust and horizontal strain* upon the gudgeons; the transverse strain † upon the bolt or bolts supporting a bell during the motion; and the greatest amount of strain on any part of a cylindrical section of the top of the bell measuring the tendency to tear out the boss.

In a previous discussion, the direct strain upon the bolt or bolts supporting a bell in motion was stated to be six times the weight of the bell; but while it was shown that it could never amount to five times, it would be found that in actual cases it rarely, if ever, exceeds four times the weight. The horizontal strain upon the gudgeons is of importance, as the measure of the force tending to pull the framing to pieces and to cause oscillations of the tower. The amount and direction of the horizontal strain undergo remarkable fluctuations during the motion of the bell. It is at first a thrust which becomes a maximum at an angle with the vertical of 26° 44′; diminishes to nothing at 48° 11′; increases again to its greatest value at 124° 3′, and again becomes nothing at the lowest position; passing through a series of values equal and opposite to these as the bell ascends on the opposite side. The equation for the horizontal strain indicates one advantage obtained by letting the bell into the stock, namely, the diminution of the horizontal strain; the importance of which fact will be appreciated by architects.

The transverse strain upon the bolt or bolts supporting a bell during the motion is for a bell hung on Mr. Baker's principle, and perhaps in most cases, of even greater importance than the direct strain. It is at its maximum value in the horizontal position of the bell.

The effect upon the bell tending to produce fracture is a combination of the effect of the direct and transverse strains. The measure of that tendency is the strain per

---

* $$S = 2w\frac{G}{L_1}(1-\cos\beta) - w\cos\beta,$$

where S is the direct strain on the bolt or bolts, w the weight of the bell, G the distance of the centre of gravity of the bell from the axis of suspension, and L_1 the radius of oscillation of the whole moving mass, including stock, &c.; β the angle the bell has passed through from rest in the highest position. The maximum value of S occurs in the lowest positions of the bell, and is

$$S = w(1+4\frac{G}{L_1}).$$

* $$S_2 = w_1\frac{G_1}{L_1}(2\sin\beta - 3\sin\beta\cos\beta),$$

where S_2 is the horizontal strain on the gudgeons, w_1 the weight of the whole moving mass, and G_1 the distance of its centre of gravity from the axis of suspension. The maximum value of S_2 is $3{\cdot}04\, w_1\frac{G_1}{L_1}$ which occurs when $\beta = 124°\ 3'$, or $235° 57'$.

† The moment of the transverse strain

$$Pp = \sin\beta\left\{G(1-\frac{L}{L_1}) + D(1-\frac{G}{L_1})\right\}$$

where L is the radius of oscillation of the bell, D the distance of the point at which the transverse strain is to be ascertained from the axis of suspension (measured in the opposite direction from G). The maximum value of Pp occurs in the horizontal position of the bell, and is

$$Pp = w\left\{G(1-\frac{L}{L_1}) + D(1-\frac{G}{L_1})\right\}$$

superficial inch on that part of the section of the bolt which is subjected to the highest tension.* The greatest amount of strain on any part of a cylindrical section of the top of the bell, measuring the tendency to tear out the boss, is represented by a similar equation.†

These formulæ being applied to the case of a bell of two tons weight, represented by Mr. Baker's model, the maximum direct strain on the bolt supporting the bell is found to be 12,231 lbs., or 5 tons, 9¼ cwt., or less than three times the weight of the bell; the maximum horizontal strain on the gudgeons 5,497 lbs. or about 2 tons, 9 cwt. The moment of the transverse strain at the top of the boss is equal to that of a weight of 1,439 lbs. acting through the centre of gravity of the bell, and is therefore somewhat less than one-third of the effect which would be produced by the weight of the bell if sustained in a horizontal position by means of a force applied to the wheel or stock. The greatest strain per superficial inch which would arise in any part of the section of the bolt during the motion of the bell would be, with a four-inch bolt, 7,486 lbs., nearly 3 tons, 7 cwt., about one-eighth of the breaking strength of wrought iron. The maximum strain, per superficial inch, on any part of any section of the top of the bell, the thickness of the top being 1¾ inch, the diameter of the boss 9 inches, is 548 lbs.

The breaking strain of bell-metal may be taken at above ten tons per inch of section; there can therefore be little danger of tearing out the boss.

In the 5 cwt. bell exhibited at Paris by Mr. Baker, the weight of the bell and clapper is about 567 lbs., and the greatest direct strain on the bolt 2,126 lbs., nearly 3¾ times the weight, the maximum horizontal strain on the gudgeons 1,162 lbs. The transverse strain is little more than one-eighth of that which would arise if the bell were forcibly retained in a horizontal position by a pressure applied to the wheel or stock. The maximum strain per superficial inch, arising on any part of the section of the bolt immediately above the boss, is 1,821 lbs. or about 17¼ cwt. The maximum strain on any part of the crown of the bell is .346 lbs. The small amount of transverse strain, in this case, compared with the other, arises partly from the comparative lightness of the stock and wheel (about one-eighth of the weight of the bell, while in the former case their weight was nearly one-fourth), and partly from the bell being less sunk into the stock.

Without applying the formula to more cases, it may be considered sufficiently evident that bells may be hung with perfect security in the manner recommended by Mr. Baker. Whatever may be the strain upon the bolt, its dimensions may be proportioned accordingly, so as to give it any required strength, and it should be observed that its power of resisting the transverse strain, which is the most important one, increases with the cube of the diameter.

Bells, however, which are not intended to be swung require much slighter support, the strain being limited to the dead weight of the bell. If this were not the case, the proposed mode of hanging the great bell at Westminster would be very objectionable. It appears that it is intended to rest with a flange on a number of hooks made at the ends of bolts. Now, every one is aware that a bent rod of wrought iron will straighten with a strain many times less than that sufficient to rupture it. Still, provided these hooks be sufficiently numerous and strongly made, there was no reason to suppose that the bell would be actually unsafe. Although Mr. Denison had not expressed a very flattering opinion of Mr. Baker's system of bell-hanging, he had paid Mr. Baker the highest compliment, by adopting the essential principle of his invention. With a view to remedy the evils resulting from the clapper constantly striking the bell in the same point, Mr. Baker proposed to hang bells upon an axis, in such a manner that they might be readily turned round, so as to present in succession to the blows of the clapper every part of the sound-bow. He recommended that this should be done by hanging the bell upon a single central bolt, certainly the simplest and best mode of effecting the object; but in the specification of his patent, he also claims the hanging of a bell upon an "axis cast on to the top of the crown." This is the mode adopted by Mr. Denison. The details of his plan, which are by no means an improvement, are not described

---

* $$S_2 = \frac{A}{C^2} + \frac{\sqrt{B^2c^2+16C^2}}{c^2},$$

where S_2 is the greatest strain per sup. inch on any part of the section of the bolt, $2c$ the diameter of the bolt, and A, B, C, are constants determined by the equations

$$A = \frac{2w}{\pi}\ \frac{G}{L_1},\ B = \frac{w}{\pi}\ \frac{2\ G+L_1}{L_1},$$

$$C = \frac{w}{\pi}\left\{G\left(1-\frac{L}{L_1}\right)+D\left(1-\frac{G}{L_1}\right)\right\}.$$

† $$S_5 = \frac{A}{c\ d} + \frac{\sqrt{B^2c^2+C^2}}{c^2\ d},$$

where S_5 is the greatest strain per sup. inch on any part of a given circular section of the top of the bell, the radius of which is c, d the thickness of the top of the bell, and A, B, C are determined by the same equations as before.

in Mr. Baker's specification, but the general principle of suspending a bell upon a circular projection or axis in such a manner that the bell may be turned round, is most distinctly claimed.

(To be continued.)

TOLSON'S CLOTH PATENT.

The following is a copy of the judgment of the Lord Chancellor referred to in our Number for May 10th, page 441. It is from the short-hand notes of a reporter, and possesses many features of interest.

The Lord Chancellor :—There is certainly no duty that the holder of the Great Seal has to discharge, and which he discharges with less satisfaction to himself, than the deciding of the question of whether or not he shall authorise the putting of the Great Seal to letters patent for an invention; because what he has to determine, when such an application for letters patent is resisted, is entirely in the dark, and advisedly and intentionally in the dark: whether or not, there is a *primâ facie* ground for supposing that the invention is but a colourable infringement of something that is the invention of another, or that is known generally to the public, and therefore as to which no patent ought to be granted. That, I say, is a most unsatisfactory duty, and one which, I fairly state, I never discharge with entire satisfaction to myself.

In the first place, the subject matter which one has to deal with is matter which lawyers are not at all better qualified than other persons, and perhaps in general not so nearly well qualified as other persons, to decide upon; namely, upon scientific matters as to which we can only take the information, as well as we can catch it, from the affidavits filed on the one side and on the other.

Now, here what I have to decide is, whether or not a case has been made to induce me to withhold the Great Seal to letters patent to these gentlemen, Messrs. Tolson and Irving, who seek for letters patent for an invention for improvements in giving a metallic lustre, as it is called, to fabrics. There have been several inventions for this purpose. Three have been called particularly to my attention; and in the year 1854 (probably there may be many others, but in the year 1854) the gentlemen who are now opposing, Messrs. Schischkar and Calvert, obtained their letters patent, which is thus described:—"Our invention consists of a mode or modes of improving the colours of certain textile fabrics and yarns made of wool or silk, or a mixture of wool and silk, or made of a mixture of both, or either of those materials with other fibrous materials, by imparting a lustre or lustrous appearance to such fabrics or yarns. To effect this purpose, we impregnate the fibres of the fabrics or yarns with a sulphate or an oxide of copper, lead, or bismuth, and then subject the fabrics or yarns so impregnated to the action of steam charged or mixed with a sulphuretted hydrogen gas;" and then there is a long description, three or four pages of description, as to the mode in which this is done—by plunging it into a bath, as it is called, and washing it in a number of other ingredients.

Now, with regard to the present application, it is an application, as far as we can get at it, on which we are quite in the dark as to what the exact particulars are; but it appears, to a certain extent, to be the same, because it is an invention "for imparting a metallic lustre to fabrics and yarns, by boiling them in solutions of sulphate or oxide of copper, or a salt or oxide of lead, zinc, or silver." Now, then, to that extent there is very much the same process as is adopted by Messrs. Schischkar and Calvert, because they "impregnate the fibres of the fabrics or yarns with the sulphate or an oxide of copper, lead, or bismuth." These present appellants had not that; but, on the other hand, they had zinc and silver, which Messrs. Schischkar and Calvert had not; but both of them began by saying, "We impregnate the fibres of the fabrics or yarns with a sulphate or an oxide of copper or lead;" and this present application is founded upon the suggestion that they subject the fabrics and yarns to solutions of sulphate or oxide of copper, or a salt or oxide of lead, zinc, or silver. To that extent, undoubtedly, there is no doubt a perfect similarity. I do not suppose that can be disputed. But what is suggested is, and very likely with entire truth, that though it is the foundation of what is done, yet that is not in truth a matter which forms a substantial part of the invention. That is what must be alleged on the part of the appellant; but that the real invention is that which follows, in which Messrs. Schischkar and Calvert say that, after having done this, "they subject the fabrics or yarns so impregnated to the action of steam, charged or mixed with sulphuretted hydrogen gas;" whereas in the specification, which is couched in somewhat dark terms, in order that it may be concealed from the public, I suppose, they say they proceed to dye these fabrics when subsequently acting upon such goods with hyposulphite of soda, potash, or ammonia. Now, what is suggested as the true invention is in this "acting upon the goods," as it is called, with the hyposulphite of soda, potash, or ammonia. What is said on the part of Messrs. Schischkar and Calvert is, that is substantially and exactly what they do, because acting upon these

goods with the hyposulphite of soda, potash, or ammonia will only act upon it by generating sulphuretted hydrogen gas, which is the mode in which we act according to our specification.

Now, the question is, whether that is substantially the same thing. This question has been, (not as between the present appellants and Messrs. Schischkar and Calvert directly, but as between the present appellants and Messrs. Barlow, who seems to me to be in some degree connected with Messrs. Schischkar and Calvert,) referred to a scientific gentleman, Dr. Miller; and Dr. Miller reported that "the result of this (that is, the mode in which Messrs. Tolson proposed to conduct their manufacture) is, the formation of a metallic sulphuret in the fibre, owing to the decomposition of the hyposulphites at a high temperature; but the mode of applying the sulphur is quite distinct from that directed by Mr. Barlow." Mr. Barlow is alone mentioned there; but he goes on to say, "It is neither in the form of sulphuretted hydrogen nor of a volatile compound of sulphur."

Now, although that applies in terms only to Mr. Barlow, yet unquestionably that covers also Messrs. Schischkar and Calvert, because Messrs. Schischkar say they "subject the fabrics or yarns to the action of steam, or mixed with sulphuretted hydrogen gas;" therefore I think that the result of Dr. Miller's report certainly is that there is a substantial difference in the mode of acting upon the fabric after it has been plunged in this solution, and in the mode in which that acting takes place in the proposed process for which Messrs. Tolson are seeking a patent, and the mode in which, as he says, Mr. Barlow effects the object. I think that must be taken also to cover the mode in which Messrs. Schischkar and Calvert obtain this result.

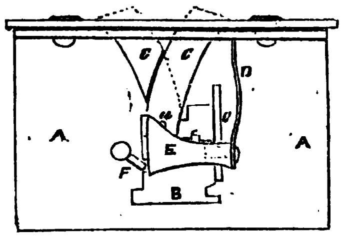
Now, that is the whole case that I have to decide upon; and the question is, whether, in that state of things, I ought or ought not to direct the letters patent to be sealed. In my opinion, I think I must direct them to be sealed; and for this reason, that although I am by no means otherwise than alive to the observation that it is a fallacy to say I do no injustice, for I may do great injustice, or at least injustice—I must not call it injustice, but great hardship to the present patentees,—if this is an infringement, they no doubt have a legal remedy (but it is a troublesome and expensive remedy); on the other hand, if I refuse this grant, which, after all, is a matter in some degree of favour, I entirely shut out the appellants from the opportunity of contending at a future time, when they are using this invention, that it is substantially different, and therefore one upon which there is no legitimate ground for disputing the application. I think, therefore, that I must grant the prayer of this petition; but I shall grant it with no costs at all, because it is a very complicated matter. I simply order the letters patent to be sealed.

COPE AND COLLINSON'S IMPROVED LOCK.

An improved lock, represented in the accompanying engravings, has just been registered by Messrs. Cope and Collinson, of Birmingham.

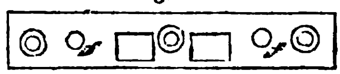
Fig. 1 is a view of the interior of the

Fig. 1.



lock; fig. 2 is a plan; and fig. 3 a side view of the keeper; fig. 4 a front elevation of the bolt and slide on which they are centred; and fig. 5 a view of the spring and tumblers shown in a reversed position to that

Fig. 2.



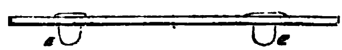
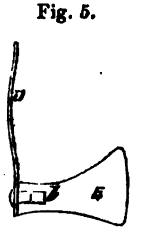
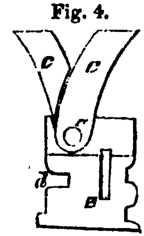


Fig. 3.

in fig. 1. A A is the lock-plate; B a slide for shooting and withdrawing the bolts, C C, which are centered on a pin, a, fixed in the slide; D a spring pinned to the back of the tumbler, E, which is armed with a

Fig. 5. Fig. 4.





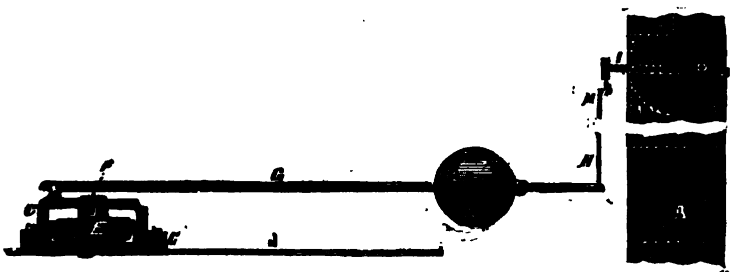
projecting tongue, b, for fitting into one or other of the grooves in the back of the slide, and holding the bolts, shot or withdrawn, according to the action of the key; c is a guide on the lock-plate for the back of the slide; F is the key. The key presses back

the tumbler, and releases the tongue from one or other of the grooves in the slide, and at the same time propels the slide by taking into a groove, *d*, in the front thereof, up or down, as may be required, for shooting or withdrawing the bolts; *e e* are dowels upon the keeper for taking into corresponding apertures, *f f*, in the top of the lock-plate. The novelty consists in the curved shape of the bolts, and in their being caused to fly out and overlap the keeper, as shown in the dotted lines in fig. 1.

MARCUS AND TAYLOR'S DRAUGHT-REGULATOR FOR FURNACES.

Messrs. Marcus and Taylor, of London, have recently introduced the apparatus illustrated in the accompanying engraving for the purpose of regulating the draught of furnaces, and, consequently, the heat and steam generated.

A is the funnel or chimney, and B the damper (shown in dotted lines), by opening or closing which the draught is increased or diminished. C is a case containing a flexible diaphragm D, and a piston E, which works through the top of the case C. This piston E, carries a pin or fulcrum F, the upper end of which comes



against the underside of a lever G, which again acts, by means of the rod H, upon the axle I of the damper B. The case C rests upon a sole plate, J, and a pipe K, (shown in dotted lines,) conveys steam from the boiler into the case C, beneath the diaphragm D. It is evident that the steam by pressing against the diaphragm D, will, when its pressure exceeds a certain amount, raise the piston E, and the pin F, and thereby close, or partially close the damper B. The pressure is regulated by the movable weight W, which may be set in any required position on the lever G.

An apparatus of the foregoing description is at work at Mr. Wagner's sugar refinery, Wellclose-square, London Docks, where further information respecting the invention (which the inventors are patenting) may be obtained.

THE HOBBS LOCK PICKED.

The *Illion Independent* asserts that the Day Newell Lock, manufactured at New York, commonly known as the "Hobbs Lock," has at last been picked by Lynus Yale, jun., of the adjoining village of Newport. It says:—"The exact *modus operandi* of picking the lock, of course, is not expected to be made known to the public just at present; but it is sufficient to say that, by a singular and ingenious method, the action of the key upon the curve of the tumblers of the lock is mapped out, and from this a wooden key is made, which unlocks and locks the lock, and in all respects operates on it as perfectly as the true key. In this respect the lock was opened in the presence of the cashier of the Dairyman's Bank, Newport, N.Y., and of the president of the Port Stanwick Bank, Rome, N. Y. And within a few weeks was so opened a 300 dollar lock on a jeweller's safe, in Wall-street, New York; from all of whom certificates to this effect have been taken. This statement of course will astound the world, but it is even true."—*Wolverhampton Chronicle.*

Health, Work, and Play. Suggestions, by HENRY W. ACLAND, M.D., F.R.S. Parker, Oxford and London, 1856.

AFTER the last visitation of the cholera, Dr. Acland, of Oxford, was called upon to draw up an account of the disease as it occurred in that city. This he did in the work entitled "Memoir on the Cholera at Oxford, in 1854, with Considerations suggested by the Epidemic." The present publication is a cheap reprint, in a separate form, of one of the chapters of the "Considerations," with a few necessary modifications. It is written in a highly liberal and enlightened spirit, and is calculated to greatly promote the truest of all social reforms.

WOODCOCK'S FURNACE.

To the Editor of the Mechanics' Magazine.

SIR,—In reply to Mr. William's letter in your Number of this date, it will probably be sufficient to refer to your impression of January 6, 1855. In a letter signed "C.," it is stated that Gilbertson's patent, dated January 15, 1828, was for "*a perforated bridge*" used "*to diffuse the heated air freely among the smoke of the fire.*" A second reference to "The Minutes of Proceedings of the Institution of Civil Engineers," and to my paper read before that Institute at the meeting of November 14, 1854, and its discussion on the following week (page 18), will show that Mr. Lowe said, that "he had for *many years*" used "*the hollow perforated bridge* said to have been introduced upwards of thirty years ago by Mr. Josiah Parkes."

In answer to my remark, that "hot air should be given to the *gases*" to prevent their being *cooled down* below their "flame points," Mr. Williams speaks of the "*carbon of flame*" at the temperature "of incandescence, or 3,000°." The *gases* alluded to are not in a state of flame, and are at a temperature in no degree approaching 3,000°. The mixture of the gases with oxygen at degrees of heat far below 3,000° is sufficient to insure their combustion—such lower degrees, being the "flame points" alluded to —not the 3,000° they may reach when their ignition is accomplished.

Next to the hydrogen, the carbonic oxide, for which Mr. Williams seems to have so much contempt, is probably the most readily inflammable gas in the furnace.

I am, Sir, yours, &c.

WILLIAM WOODCOCK.

12, Bishopsgate-street Within,
June 6, 1856.

[This discussion may, we think, end here with perfect fairness to both of our correspondents.—ED. M. M.]

MECHANICAL LOCOMOTION.

To the Editor of the Mechanics' Magazine.

SIR,—Mr. Rock is so far right that a drum in which an engine worked freely on wheels of its own would be "a portable railroad." This is not the case of the squirrel in his cage, and I must confess that this was not the case to which I understood him to allude.

An engine may be so constructed within a drum as to be connected with it precisely as a locomotive engine with its driving wheels or to communicate motion to it by means of some other arrangement of arms or connecting rods, either permanently or alternately (as the feet of a squirrel running in its cage) attached to the drum. The case then becomes what the other was not, strictly analogous to that of the locomotive, and the drum is no longer the railroad but the driving wheel.

How the boy at Astley's propelling the ball (on which he stands) with one foot, could make use of his toes as propellers while he is supported on his heel, or *vice versâ*, I do not understand, but if Mr. Rock were to see him do so without touching the ball with his heel, he would probably maintain that the great toe served for support while the little toe acted as a propeller. Indeed it is quite open for him to assert, that as the ball itself is in contact with the ground by a small surface, and not by a mathematical point, one part of this surface is propelling while another is supporting. Of course demonstration is totally unnecessary.

One word more only with Mr. Rock. He appears to imagine that a person walking (or say, a rabbit running) is supporting his body on one foot, while he propels himself with the other. A moment's observation might serve to relieve him of this delusion; but once let a man abandon himself to a theory and he lives thenceforth in an enchanted circle, and is constantly mistaking its aërial creations for actual facts, incapable of seeing anything which might serve to convince him of error.

And now to turn to the general question. I differ, though perhaps only in the mode of expression, from "W.," when he states that the case of a rower is not analogous to the propulsion of a locomotive. The two cases have considerable differences, but at the same time sufficient analogy to throw considerable light on the matter. But an analogy, however useful to illustrate a fact, is seldom sufficient to explain, and never to demonstrate it.

It seems that the point we are aiming at is not so much to account for the motion of a locomotive engine as to give a

clear explanation of it. And an explanation which may appear to some minds most satisfactory, may, though perfectly correct, seem either insufficient or clumsy to others.

To me it is sufficient to say, that the engine causes the wheel to rotate, and this rotation may take place in two modes; either by the wheel sliding on the rail, the engine remaining at rest, or the point in contact with the rails remaining at each instant at rest and the engine progressing; that motion actually taking place to which the least resistance is presented.*

* * * *

I would only further remark that, when the problem is accurately examined, one can hardly account for the fact that it should ever have appeared paradoxical. This is always the case with what are called mechanical paradoxes, the appearance of contradiction arising merely from a superficial examination of the phenomena and an imperfect acquaintance with, or temporary oversight of, the relations necessitated by the fundamental laws of mechanics.

I am, Sir, yours, &c.,
R. C. Nichols.

London, June 5, 1856.

To the Editor of the Mechanics' Magazine.

Sir,—If "C." will lend me one of his illustrations, I think I shall be able to make my meaning upon the subject of the "two points" clear to him. "C." imagines an engine without wheels, and with the boiler placed "right on to the rails, on only one surface or point of support," and that when so placed it may "propel itself and any one upon it, by pistons from its side striking horizontally," &c. Now, by the light of this illustration, let "C." re-read my proposition, "that the locomotive machine must have at least one point of support besides that by means of which its progressive motion is effected." He will then see that he has conceded me my point of support, by placing his boiler upon the rails, and that, granting the possibility of his machine, it effects progressive motion by means of other points than that upon which the machine primarily rested.

I contend for a point of support for the mass of the machine, and a point of impact for the propelling force; I do not say, nor have I said, that the points of impact must necessarily be upon the surface on which the machine rests; but this I do say, that every point of impact by means of which a force within a machine disturbs the gravity of the mass in such manner as to cause propulsion, is for the time and to a certain extent a point of support. Thus "C.'s" engine, upon the "touch-and-go" principle, has its two points as well as the ordinary locomotive.

I am afraid of encroaching too much upon your space, and must leave my explanation of the action of the locomotive engine with the crank pin above the centre, as it stands in my first letter, with this additional remark, that the action of the vertical spoke is similar to that of an oar in rowing, except that the latter moves horizontally: the axle in this comparison stands for the rowlock of the boat, the ground for the water, and the crank pin, or rather the eye of the connecting rod, for the hand of the rower. Consider the engine at this part of its action as a rower; his seat is upon the front axle, he presses with his feet upon the hind axle (through the cylinder, the body of the engine, and the springs), and pulling through the piston rod, rows himself along by means of the spoke of the driving wheel. Unless "C." wants to know the action which goes on among the molecules of the various parts of the engine when acted on by the moving force, I cannot see what further information he can require. I have not much to say in reply to "W.," for I consider that he has put himself out of court by denying the authority of the judge; and as we have no common arbiter, it is of little use to argue. He abjures the "light of nature," and by consequence all that accumulation of discoveries made by means of it, which men call "science." "W.'s" own light, whatever it may be, has apparently failed to show him that as Dr. Whewell says "the steam in the cylinder of a steam engine which presses the piston, presses with equal force the other end of the cylinder," and that as the cylinder of a locomotive engine is rigidly fixed to the body of the engine, and moves with it, if the resistance to the motion of the piston be greater than that to the motion of the cylinder with the engine attached, as it is in the under or backward stroke, the engine will be moved, notwithstanding "W.'s" dictum that "it is impossible for a power carried in a moving body to produce motion, except by its being applied to some part which has a power of motion relatively to the body." Let "W." add the words "and reacting against the body itself, or some part which is rigidly attached to it," and I will then agree with him on this point, however we may differ upon others.

I am, Sir, yours, &c.,
James Rock, Jun.

Hastings, June 9, 1856.

---

* We regret that our arrangements compel us to omit the whole of an investigation of the general question which follows this paragraph in our correspondent's letter.—Ed. M. M.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

GLASS, W. *Improvements in obtaining a deodorizing and disinfecting material.* Patent dated October 18, 1855. (No. 2335.)

The patentee deodorises and disinfects by using acetate and sulphate of zinc, separately or in combination, and thereby obtaining a material free from the acid, caustic, and deliquescent properties of the former, besides being in the state of powder, and therefore safe and easy of carriage.

STATHAM, S. *Improvements in electric telegraph cables.* Patent dated October 18, 1855. (No. 2336.)

The patentee takes a case of gutta-percha or other insulating material, containing therein one or more metallic wires, strips, or plates, and places over such core strands of hemp, or cord, employing various modifications. And he encases the core covered by one or other, or all of the materials just named, in an outer casing or tube of gutta-percha, or any of its known compounds, or either of these combined with metallic or other substances. By these or similar means the patentee is enabled to produce a light, flexible, and strong cable, especially suited for submarine purposes, in which the weight may be regulated by the employment of metal wires, strands, or plates, or fibrous materials between the insulated wire or wires and the outer coating, as well as by the employment of gutta percha or any of its known cōmpounds, or by combining with either of these, more or less, some suitable substance heavier than gutta-percha itself, with the gutta-percha or gutta-percha compounds employed for the outer casing.

GRAHAM, Dr. *Improvements in the manufacture of paper-hangings, and in machinery to be used in such manufacture.* (A communication.) Patent dated October 18, 1855. (No. 2337.)

The patentee prepares the surface with a peculiar kind of clay, known in the United States as New Jersey clay. This clay may be called a sesquisilicate of alumina; that is, it contains two atoms of alumina to every three atoms of silicic acid, whereas the other clays are bisilicates of alumina, containing only one atom of alumina to every two atoms of silicic acid; and clay, therefore, that contains the above ingredients in the proportions named, may be used for the purposes of the invention. The invention also relates to the machinery employed in the "grounding" of paper hangings, or applying the ground colour thereto; and in polishing or glazing the ground colour before the paper is printed with the pattern.

WAGSTAFF, J. C. *Improvements in the manufacture of seamless garments and other seamless fabrics.* Patent dated October 18, 1855. (No. 2339.)

This invention relates to the method of producing garments by felting the different parts together as described in the specification of a patent granted to Moses Poole, November 19, 1851, No. 787, and consists in cementing the different parts of the garment together (so as to hold them until joined by felting) in place of sowing as there described; also, in shaping garments formed by felting the different parts together, by stretching them on hollow metal forms, into which steam or other heating medium is introduced.

STIRLING, J. D. M. *Improvements in coating silver, copper, zinc, and iron, and alloys of those metals.* Patent dated October 18, 1855. (No. 2340.)

This invention has for its object the coating of sheets of silver, copper, zinc, and iron, or alloys of these metals, with thin sheets of aluminium, by means of pressure, heat being used when necessary.

SMITH, J. *Improvements in the construction of bedsteads, such improvements being applicable to carriages, ambulances, and other articles.* Patent dated October 19, 1855. (No. 2341.)

This invention consists in the application of laths or springs composed of lance-wood, to bedsteads and other articles.

TATHAM, W. *Improvements in machinery or apparatus for preparing, spinning, doubling, and winding cotton, wool, flax, silk, or other fibrous substances.* Patent dated October 19, 1855. (No. 2342.)

This invention relates to forming the tubes or collars that support the spindles so as not to fit the spindles at the bottom ends, but to fit them at any suitable part above those ends; to securing the spindle-tubes or collars to the rails that carry them by means of nuts, when they do not pass into the interior of the bobbins; to forming the spindles of tubular malleable iron or steel; and to an improvement on part of the invention for which letters patent were granted to the patentee, October 3, 1854, in which is shown a flyer revolving round a stationary spindle and tubular stud, with the legs of the flyer turned upwards. This improvement consists in causing the spindle, which heretofore was stationary, to revolve with the bobbin. The invention also consists in constructing those parts of the driving drum or cylinder round which the band, cord, or tape passes, when driving the spindles, flyers, and bobbins of a conical, taper, or other convenient form or shape, for the purpose of diverting the band from the line it was previously going in, when passing on the driving drum from the wharve or other apparatus.

GILBEE, W. A. *Improvements in the application of silicate of potash to hardening and preserving stones and calcareous materials.* (A communication.) Patent dated October 19, 1855. (No. 2343.)

This invention consists—1. In the process of impregnating stone and other calcareous materials with a solution of silicate of potash. 2. In determining the different degrees of strength to be given to the solution of silicate of potash. 3. In the means of drying the stone, either before or after the saturation, to insure a favourable result.

SMITH, W. *Improvements in sewing machines.* (A communication.) Patent dated October 19, 1855. (No. 2344.)

This invention comprises certain apparatuses for producing a lock stitch, driving a spool-case, taking up the slack of the needle-thread, cording the edges of materials, grinding and feeding the braidings, driving two or more vertical needles simultaneously, and producing tension and the delivery of the thread from the spools.

GILLER, H. *An improvement in globes and shades for gas and other lights.* Patent dated October 19, 1855. (No. 2347.)

This improvement consists in forming globes and shades of prisms of glass known in the trade as spangles or other like pieces of glass, similar to those used in the construction of lustres. The spangles are strung together or otherwise attached, and are made to assume any form by being shaped over a suitable frame. By varying the colour and shape of the prisms very elegant and novel effects will be obtained.

FIELD, W., and E. JEFFREYS. *Improved means for securing the rails of railways in their chairs or bearings.* Patent dated October 19, 1855. (No. 2349.)

This invention relates to a mode of wedging up the rails, whereby not only will the rails be securely attached to their chairs, but the butt ends of adjoining rails will be held firmly in position. The patentees show several plans, in each of which they employ a compound wedge, which, when driven up, will press both laterally and vertically against the rail or rails.

CRAVEN, T., and M. PICKLES. *Improvements in weaving.* Patent dated October 20, 1855. (No. 2350.)

The object of this invention is the production of a floated pattern in gauze by a modification of the mounting of the ordinary Jacquard loom. It consists in using a second harness to the Jacquard action, in such manner that, in addition to the portion of the warp raised or depressed for ordinary figured weaving, any thread or threads may be raised or dropped by the Jacquard action, in connection with the half heald usually employed in gauze weaving, and in the application of this arrangement to the production of a woven floated figure on a cross gauze ground in any fabric.

MASSIP, P. A. *A machine for preparing hat linings.* (A communication.) Patent dated October 20, 1855. (No. 2351.)

This invention consists in improved apparatus for pasting, cutting, and folding materials to be employed in the manufacture of hats.

PARANT, P. A. H. *Improvements in manufacturing millstones.* Patent dated October 20, 1855. (No. 2352.)

The patentee prepares a mixture of pulverised kaolin, or any other fusible or vitrifiable material of similar nature, as for china, hardware, or glass manufacturing, with a certain proportion of wood, charcoal grains, or any other combustible material in small fragments, which are blended with it. He casts of this in a mould twelve sectional blocks, which, combined, form a stone. When the blocks have been shaped and burnt, he takes the number of them required to form a millstone and adjusts them together, by putting a thin layer of plaster between each block; he then binds them all together by means of one or more iron hoops, and the stone is then fit for use.

DODGE, N. S. *Improvements in machinery or apparatus for spreading or distributing water-proofing, or similar compositions, over webs or sheets.* (A communication.) Patent dated October 20, 1855. (No. 2353.)

This invention consists in passing the endless band under a fixed knife or doctor, extending across the machine, the composition being laid on the web by hand with a broad knife or trowel, and spread evenly over it by the knife or doctor. The web is carried at each end by suitable rollers supported in standards, one of which is made to traverse, by means of a windlass, along suitable rails, so as to keep the web well stretched. The surface of the web is kept in a lateral state of tension by passing over a suitable temple or stretcher bar, and one of the carrying rollers is fitted with reversed spiral projections for the same purpose.

VALENTINE, T., D. FOSTER, and G. HAWORTH. *Improvements in power looms.* Patent dated October 20, 1855. (No. 2354.)

When threads of warp break during weaving, the broken ends next the cloth are generally driven up by the reed, so as to form loops on one or other of the surfaces of the fabric. The patentees apply transversely of the fabric a bar with projecting points or teeth, to vibrate close to the surface of the fabric. The teeth are inclined, so that in the traverse of the bar in one direction they may pass over any such loops, but in passing back they take into those loops, by which the movement of the

bar will be arrested before it has fully returned, and the driving strap be shifted from the fast to the loose pulley, thereby stopping the loom. The invention also relates to means for regulating the tension upon the warp-threads, and consists of certain improvements upon a recent patent of Mr. G. Collier, of Halifax.

WHITAKER, F. *Improvements in the construction of sewing machines.* Patent dated October 20, 1855. (No. 2355.)

This invention relates to sewing machines in which two threads are employed, and the stitch is made as follows:—The needle passes through the work, and carries a loop of its thread through with it. This loop is then caught by a hook, which carries it round and over a globular box, which is loosely held between suitable supports, and in this box a ball of thread is placed. The end of the thread is drawn through a hole in the ball, so that when the needle thread is drawn over the ball as before-mentioned, the ball and needle threads are looped through each other; the hook which catches the needle thread travels about three-quarters round the ball, so that when it gets near the end of its course the loop slips off (because of the reversed position of the hook), and when the needle thread is drawn tight the stitch is complete, and the hook returns.

WOODROW, H. *Improvements in shirts.* Patent dated October 20, 1855. (No. 2357.)

The sleeves are cut in such a manner that the ordinary shoulder strap is dispensed with, and the front is made to fit neatly and closely to the person. The method adopted consists in cutting the sleeve of such a shape, at the upper end, as to cause this part, when attached to the body of the shirt, to reach up to the collar-band. In order to facilitate the putting on of the shirt, it is proposed to cut the shirt so as to open at the front or side. Another improvement consists in adapting to a shirt with a plain front a removable ornamental front.

TEALL, W. *A mode of treating certain materials containing fatty or oily substances, in order to extract those fatty or oily substances therefrom.* Patent dated October 22, 1855. (No. 2358.)

The material is put into proper tanks or vats, with water slightly acidulated, and the whole is made to boil, and is stirred up until it becomes a sort of pulp. This is put into bags or cloths of close texture, which are put into closed presses, into which steam is introduced, and it is pressed in the same way as in the extraction of grease from soapy water, as is well understood. The boiling, though not necessary, facilitates the operation.

PARKES, A. *Certain preparations of oils for, and solutions used when water-proofing, and for the manufacture of various articles by the use of such compounds.* Patent dated October 22, 1855. (No. 2359.)

The first part of this invention relates to the treatment of oils, so as to produce a change in the oil or compound by the use of chloride of sulphur. The second part relates to the use of solutions of gun-cotton, or other similar compounds, for manufacturing purposes generally. The patentee dissolves gun-cotton, or other similar compound, in vegetable naphtha, alcohol, methylated or other ethers, or other solvents of gun-cotton. He also uses colouring agents or metallic bronzes with solutions of gun-cotton for water-proofing and coating other articles, such as paper, &c.; also gums or resins, or stearine in solutions of gun-cotton for the same purposes.

M'GLASHAN, A. and E. FIELD. *Improvements in printing presses.* Patent dated October 22, 1855. (No. 2360.)

By this invention both sides of the sheets of paper are printed or "perfected" before leaving the machine. The machine described is a single cylinder machine, and the "grippers" are so arranged as to hold the sheet firmly while being printed upon both sides, without releasing their hold during the whole operation. The turning of the sheet when printed upon one side, in order to present the plain surface to the second form of type, is effected by a mechanical arrangement connected with the cylinder.

LENNY, C. *Improvements in carriages.* Patent dated October 22, 1855. (No. 2361.)

This invention consists of a light open framework body, provided with sides or wings, extending over and above the tyres or upper portions of the wheels, in an arched or shell-like form, the axles being secured through the intervention of improved double C-springs to the underneath fixings of the seat, in such manner as to work freely within the centre of the open frame of the said body.

SCULLY, V., and B. J. HEYWOOD. *Improvements in clips or holders for suspending railway tickets and other small articles.* Patent dated October 22, 1855. (No. 2363.)

The patentees show their improvements under a variety of forms. They all possess two principal features, viz., 1. That of holding the ticket in such a manner that the ticket collector may see at a glance the nature of the ticket without removing it from the clip. 2. That the clip may be readily attached to a button-hole or other appendage of the traveller's garment.

GREGORY, A., and J. JILLINGS. *Improvements in cleansing the basin or pan of water-closets, and in apparatus for the same.* Patent dated October 23, 1855. (No. 2366.)

These improvements consist in the mechanical application of a brush, scraper, or wiper, simultaneously with the rush of water in the basin of the closet, in order to facilitate the cleansing of the basin.

BELLAMY, J. *Improvements in graining and in producing imitative ornamental surfaces, and in certain instruments or apparatus to be employed for such purposes.* Patent dated October 23, 1855. (No. 2369.)

The following is the process by which the patentee obtains upon paper the ornamental surfaces above referred to. The paper is to be "sized" and dried, and then rubbed over with a solution of gum sandarack, or mastic dissolved in spirits of wine. The surface is then grained by the use of certain tools patented by E. Barber, of Tring, Hertford, 11th October, 1846. After the colour is dry the paper or cardboard may be overgrained; this operation is also done by a roller in which the pattern of the grain is cut in relief. The paper or cardboard is finally coated with varnish, or French polished in the ordinary manner. The next part of the invention consists of a new process of graining or marbling upon glass or slate. A coat of the graining colour is first brushed over the glass; the lights are then taken out, by passing one of the graining cylinders before described over the colour, by which a portion of the wet colour is removed; when this is dry, a coat of colour which forms the ground colour of the object to be imitated is laid on. The process of marbling on glass is similar to the graining. The third part of the invention consists of a peculiar mode of graining or marbling upon the natural surface of woods. The surface of the wood is first to be planed, and then rubbed over with a coating of French polish; the ground is then laid on with a painter's brush or sash tool, and the graining or veining cylinders passed over the wet colour to take out the lights, and when dry, the "over-graining" is to be applied by laying on the colour with a suitable cylinder as before described. The fourth part of the invention comprises certain improvements in the tools described in the patent of Barber before referred to.

ROBERTS, T., and J. DALE. *Certain improvements in treating and preparing amylaceous substances for the purpose of stiffening.* Patent dated October 23, 1855. (No. 2370.)

The patentees take rice in the grain, but instead of grinding it in the ordinary manner, they wash and soak it in water until it is cleaned and partly softened; it then grinds more readily, and the meal is necessarily produced in a damp state. It is then placed in heaps, where it is allowed to heat and ferment, such fermentation producing a chemical change, so that the separation or disintegration between the starch and gluten is at once effected, the mass yielding, when boiled in water, a paste equal to the ordinary starch. The process must be slightly altered for other grain.

RICHARDSON, T. *Improvements in the manufacture of glass and clay-wares.* Patent dated October 23, 1855. (No. 2371.)

This invention has for its object the application of native borate of lime, either alone or mixed with a salt of soda, in the manufacture of glass and clay wares.

SHEARS, W. *An improvement in cases or magazines for gunpowder, or other explosive preparations or compounds.* Patent dated October 23, 1855. (No. 2372.)

This invention has for its object the manufacture of such cases or magazines with six equal sides, and consists of the application of corrugated tin or tin alloyed, or corrugated copper, brass, or other metal to the making of the sides of such cases. The hoops also are by preference to be corrugated.

NEWTON, A. V. *Improvements in machinery for making rope and cordage.* (A communication.) Patent dated October 23, 1855. (No. 2374.)

This invention consists—1. In an arrangement of gearing and parts for revolving the creals and bobbins with the required speed and in the requisite direction. 2. In the construction of the lay-up heads and caps that form the strands, and lay the same into rope or cordage. 3. In the method of constructing the apparatus used for drawing the rope through the lay-up blocks and caps, and stretching the same, and then winding the rope upon a reel into a coil for transportation; and, also, the invention relates to a method of finishing the rope by rubbing down and sizing the strands, and then drying the rope while being stretched; and to means for leading the strands off the bobbins.

SMITH, J. *Improvements in apparatus for giving alarm signals, and for extinguishing fires.* Patent dated October 24, 1855. (No. 2375.)

These improvements consist—1. Of the application of gutta-percha lines or cords, passed through chambers and other places to be protected against fire, which lines are weighted at one end to keep them extended, and so arranged that on the burning or melting of the gutta percha the weight shall fall, and in its descent strike a catch which frees and sets in action a suitable alarum. 2. Of perforated pipes, wholly or partly formed of gutta

percha or metal, through which water may be conveyed from any convenient reservoir, by turning a stop-cock; this may likewise be effected by the falling of the said weight, set in action as before.

RIVES, J. *Improvements in looms for weaving.* Patent dated October 24, 1855. (No. 2377.)

The invention consists in substituting for the ordinary jacquard cards plates of thin metal, with as many holes through them as there are needles in the jacquard apparatus. Also in the use of jacquard needles with slots formed in them, through which the hooks belonging to the other needles pass, by which arrangement the needles may be placed more closely together than is otherwise possible; and in a method of regulating the tension on the warp threads and the take-up of the work.

HEALEY, J., J. FOSTER, and J. LOWE. *Improvements in machinery to be used for drawing, moulding, forming, and forging various articles of metal.* Patent dated October 24, 1855. (No. 2378.)

This invention relates—1. To improvements upon a patent dated 26th October, 1854, and consists in the employment of an arrangement of bell-mouthed tubes, as guides for the article to be entered between the rolls or rollers, and as stops by which means the point to which the article is to be entered may be regulated. 2. To hammers for giving blows in drawing, moulding, forming, and forging or swaging metals into required shapes, and consists in lifting the hammer or ram by the adhesion of contact of revolving pulleys or rollers which have portions of the peripheries removed. Also to limiting the height to which the hammer may rise by circumscribing that surface of the hammer in contact with the pulleys or rollers. Also in the employment of a certain spring to force down the hammer.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

ELCE, J. *Improvements in self-acting mules for spinning cotton and other fibrous materials.* Application dated October 19, 1855. (No. 2346.)

This invention relates first to the winding-on motion, and consists in dispensing with the radial arm and parts in connection therewith, usually employed for winding on, and for regulating the tension of the yarn. One end of the winding-on chain is attached to the framing of the headstock, and the other is wound on the winding-on barrel in the usual manner. The motion of the winding-on barrel is transmitted to the shaft working the spindle drums by differential wheels (or a jack-in-the-box), and a friction pulley (which carries the intermediate wheels), furnished with a clip or break, that is tightened and slackened by the action of the yarn on the fallers. When the yarn is too tight, the friction pulley is released by the action of the fallers, and proportionably less motion is given to the spindles, the contrary action taking place when the yarn is too slack. The second part consists in an arrangement of parts for regulating the amount of after draught.

SMITH, N. *Improvements in mills for reducing grain and other substances.* Application dated October 19, 1855. (No. 2348.)

This invention consists in the employment of two cones placed in a reversed direction to each other, that is to say, with the base of one cone opposite the apex of the other; and in the mounting these cones, or one of them, in such manner, in suitable bearings, that the distance of one conical roller from the other may be easily regulated, whereby the degree of fineness to which the substances are to be reduced may be determined.

GAUDIBERT, H. *An improved construction of guard for preventing surreptitious removal of watches, purses, pocket-books, and other articles from the person.* Application dated October 20, 1855. (No. 2356.)

The inventor connects to one end of a small chain a spring loop or suspender, and to the other end a sharp-pointed hook or its equivalent, which will enter and hold the fabric of which the pocket is composed. The article is then attached to the spring loop, and to the ring which connects the short chain with the sharp-pointed hook.

WILSON, W. *Certain improvements in machinery for crushing grain and other substances.* Application dated October 23, 1855. (No. 2365.)

In order to vary the distance between the crushing rollers to suit the grain to be crushed, the inventor employs a bar with two inclined planes; this bar is placed parallel to the axis of the adjustable roller, and each inclined plane, when the bar is moved endwise, acts on a prolongation of the bearings in which the roller revolves. The bar is moved endwise by suitable mechanism.

OPPENHEIMER, A. *Certain improvements in machinery or apparatus for stretching or distending velvets and other piled goods or fabrics for the purpose of cutting the pile of such goods.* Application dated October 23, 1855. (No. 2367.)

This invention consists in the employment of rollers, one at either end of the machine, over and under which the entire piece of fabric is passed, the two ends of the piled fabric being secured, so as to form an

endless strap or band. Of the rollers one is secured, the other at the opposite end being rendered adjustable by means of a rack, pinion, and click wheel. For the lateral stretching two endless rails are employed, running longitudinally on both sides of the machine; one is secured to the one side, the other on the opposite side of the framing acts loosely. These rails on either side are connected to the selvages of the piled fabric by an intervening elastic strap or band. In order to adjust the rails according to the varying length of the piece of fabric while being cut, a sliding rail is secured to an adjustable roller.

COLLIER, G., W. BAILEY, and R. HORSFALL. *Improvements in drying wool and other fibrous substances.* Application dated October 23, 1855. (No. 2368.)

These improvements relate to arranging endless travelling aprons, in connection with suitable heating means, so that the fibre, upon being placed upon one apron, travels with it, and is thence transferred to another, and so on, and each apron is caused to travel in an opposite direction to the preceding, by which the fibre will be more fully turned over in passing from one to the other. The inventors form the aprons of open wire-work in sections connected together, and they are operated by supporting rollers. The heating is effected by pipes or chambers passing between or under each apron, supplied with steam or other suitable heating medium. A fan is employed to draw away the vapours produced.

WEBER, H. *Certain improvements in apparatus for motive power.* Application dated October 23, 1855. (No. 2373.)

This apparatus consists of a half cylinder (which may be made to rotate on a centre), placed in an inclined position, and supported on drums or friction rollers, on which it travels in circular guides. To the upper part of the half-cylinder is attached a weight, in such manner as to press, by means of a lever, on its upper edge, and impart to it a continuous revolving motion in the guide circles.

BEVAN, J. *Improvements in projectiles.* Application dated October 24, 1855. (No. 2376.)

This invention consists in constructing a chamber at the back of a projectile, and in filling it with gunpowder, so that when fired in a cannon, the chamber is burst and rent, thus imparting a greater force to the projectile.

PROVISIONAL PROTECTIONS.

Dated February 23, 1856.

461. John Gedge, Wellington-street South, Strand, Middlesex. Improvements in preparing and combining metallic substances for producing colours, and in manufacturing the same. A communication.

462. James Edward Boyde, of Hither-green, Lewisham, Kent, gentleman. Improvements in scythes.

Dated May 9, 1856.

1098. William Edward Wiley, of Great Hampton-street, Birmingham. Improvements in the manufacture of pens and penholders.

1104. Frederick Richard Laurence, of Southampton-street, Westminster. An improvement in the manufacture of shirt collars and wristbands.

Dated May 14, 1856.

1139. Gustavus Palmer Harding, of Kingsland, Middlesex. An improvement in the manufacture of cloth bonnets.

Dated May 16, 1856.

1159. William Thistlethwaite, of Verulam-buildings, Gray's-inn, London. Certain improvements in photography. A communication from Louis Angamarre, of Paris, France.

1161. William Harker, of Victoria-mill, Bowley, Bradford, York. Improvements in giving motion to rotating shuttle-boxes of power looms.

1163. Edmund Eaborn and Matthew Robinson, engineers, of Clement-street, Birmingham, Warwick. Improvements in machinery for grinding or reducing sugar.

1165. James Mellor, of Gorton, near Manchester, Lancaster. Certain improvements in grates or grids, applicable to sewers, drains, and other similar purposes.

Dated May 17, 1856.

1167. David Curwood, of George-street, Grosvenor-square, Middlesex. An improved apparatus for facilitating the cleaning of knives and forks.

1169. Alfred Vincent Newton, of Chancery-lane, Middlesex. Improvements in machinery for forging or pointing wrought nails, spikes, and other four-sided articles. A communication.

1171. Louis Cornides, of Trafalgar-square, Charing-cross, Middlesex. Improvements in ornamental window blinds, and such like transparent decorations.

1173. John Hynam, of Princes-square, Wilson-street, Finsbury. An improvement in the manufacture of instantaneous lights when of paper or cotton.

1175. Richard Knight, of Foster-lane, London. Improvements in apparatus for aerating liquids.

1177. Charles Carroll Tevis, lieutenant-colonel, of Paris, France. An improved revolver.

Dated May 19, 1856.

1179. John Wilkes, Thomas Wilkes, and Gilbert Wilkes, of Birmingham. A new or improved manufacture of rollers or cylinders for printing fabrics.

1181. John Leakey Bowhay, of Modbury, Devon. Improvements in drills for sowing seeds and distributing manure or water.

1183. Moses Haym Picciotto, of Crosby-square, London. Improvements in preparing flax, hemp, and other similar fibrous materials.

1185. John Wilkes, Thomas Wilkes, and Gilbert Wilkes, of Birmingham. A new or improved manufacture of rollers or cylinders for printing fabrics.

Dated May 20, 1856.

1186. William Fowler and William M'Collin, Kingston-upon-Hull. Improvements in portable steam-engines, applicable to agricultural and other similar purposes.

1187. William Maugham, of Ifield-terrace, Surrey. An improvement in rendering wood fire-proof.

1189. William Maugham, of Ifield-terrace, Surrey. An improvement in rendering cotton and other fabrics and paper uninflammable.

1190. Richard Maxwell, of Carlton - terrace, North Brixton, Surrey. Improvements in the construction of taps for drawing off liquids.

1191. James Anning Gollop, of Lower Sloane-street, Chelsea, Middlesex. An improved method of excluding dust, water, air, and other extraneous matters from doors, windows, glass, show cases and such like constructions.

1192. Samuel Rogers Toms, of Church - villas, Croydon, Surrey. Improvements in gloves.

1193. William Cardwell McBride, of Armagh, county Armagh. Improvements in machinery for scutching flax and other vegetable fibrous substances.

1194. Alfred Vincent Newton, of Chancery-lane, Middlesex. An improved mode of preparing the double chlorides of aluminium and sodium, and aluminium and potassium. A communication.

1195. William Edward Newton, of Chancery-lane, Middlesex. Improvements in the process of manufacturing oil from seeds, and in the machinery and apparatus to be used therein. A communication.

1196. Alfred Vincent Newton, of Chancery-lane, Middlesex. An improved rotary pump. A communication.

Dated May 21, 1856.

1197. Joseph Henry Reynell de Castro, of Manchester. An improved method of propelling railway or other carriages up inclines. A communication.

1198. David Shaw, of Gee Cross, Chester. Improvements in looms and apparatus employed therewith for weaving.

1200. John Perron, of Buttesland-street, Hoxton New Town. Improvements in ornamenting surfaces of wood, ivory, bone, and such-like substances..

1201. Alexandre Henri Dufresne, of Rue de l'Echiquier, Paris, France. An improved process of gilding and ornamenting steel and other metals.

1202. John Cope, of Birmingham, Warwick. An improvement or improvements in the manufacture of buttons made of pearl or other shell, ivory, bone, or wood.

1203. Manoah Bower, of Birmingham, Warwick, and John Barwell, of Birmingham aforesaid, gentleman. A new or improved method of joining the parts of metallic and other bedsteads and other articles of furniture.

1204. Henry Medlock, of Great Marlborough-street, Middlesex. Improvements in the manufacture of glass, enamels, and other vitrified substances.

1205. James Holdin and William John Dorning, of Manchester, Lancaster. Improvements in bouking, bleaching, washing, and cleansing textile fabrics and materials. Partly a communication.

1206. Alexander Allan, of Perth, North Britain, and Thomas Hunt, of Crewe, Chester. Improvements in the construction of locomotive and other steam engines and carriages, and in the rolling stock of railways.

1207. George Heron, of South-street, Newcastle-on-Tyne. Improvements in machinery or apparatus for raising, lowering, moving, or transporting heavy bodies.

1208. Rudolph Hermann Schwabe, of Glasgow, Lanark, N.B. Improvements in the manufacture or production of ornamental fabrics.

1209. Macleroy Neilson, of Thorn Mill, Renfrew, N.B. Improvements in the treatment, preparation, or finishing of yarns or threads.

1210. Edward Greenless, of Glasgow, Lanark, N.B. Improvements in the treatment, and preparation or manufacture of textile and pulpy materials.

1211. Charles De Jongh, of Lautenbach, Guebwiller, France, manufacturer. An improved method of separating and assorting combed fibres of different lengths.

1212. Thomas Lawrence, of Birmingham, Warwick, manufacturer. Improvements in machinery to be used for grinding and polishing gun barrels, swords, matchets, bayonets, scythes, fire-irons, and other articles similar in transverse section to any of those above named.

1213. Edward Hammond Bentall, of Heybridge, Essex. Improved machinery for crushing or splitting grain or seeds. A communication.

1214. William Edward Newton, of Chancery-lane, Middlesex. Improvements in machinery for spinning or twisting fibrous substances. A communication.

1215. William Henry Aston and Samuel Hopkinson, of Zetland Mill, Huddersfield. Improvements in steam-boiler furnaces and apparatus employed for supplying water to steam-boilers.

1216. William Joseph Curtis, of Sebbon-street, Islington. Improvements in the manufacture of iron railway wheels.

Dated May 22, 1856.

1217. William Galloway and John Galloway, of Manchester, Lancaster, engineers. Improvements in steam-boilers.

1218. Alexandre Hubert, of Bordeaux, Dept. de la Gironde, France. An improved apparatus for ventilating ships or vessels.

1219. John Charles Pearce, of the Bowling Iron Works, near Bradford, York. Improvements in apparatus for generating and economising steam.

1220. William Richelieu Hodges, of Manchester, Lancaster. Improvements in machinery or apparatus for manufacturing loop-pile fabrics. A communication.

1222. Alexandre Tolhausen, of Duke-street, Adelphi, London. Improvements in clock-work, part of these improvements being applicable to other regulating purposes. A communication.

1223. Job Cutler, of Sparkbrook, Birmingham, Warwick. Improvements in the manufacture of metallic pipes or tubes to be used for various purposes.

1225. Germain Barruel, of Rue Hautefeuille, Paris. Improvements in treating cotton seed.

1226. Robert Bell, of Glassford-street, Glasgow. An improvement in the manufacture or production of ornamental fabrics.

1227. Charles Dewick, of Stanley-street, Leicester. Improvements in machines, generally called "rib frame or rib machine" for producing fancy hosiery.

1228. James Howard, of Bedford, and George Williams Baker, of Woburn, Bedford, farm bailiff. Improvements in machinery or apparatus applicable to the tilling of land.

Dated May 23, 1856.

1229. Thomas Dawson Russum, of Tipton, Stafford. A new or improved brake for steam engines and other motive power engines.

1230. Samuel Berrisford, of Portwood, Chester, and Enoch Wilkinson, of Oldham, Lancaster. Certain improvements in looms for weaving.

1231. John Gedge, of Wellington-street South, Middlesex. An improved gridiron. A communication.

1232. John Gedge, of Wellington-street South, Middlesex. Improvements in looms. A communication.

1233. John Gedge, of Wellington-street South,

Middlesex. Improvements in machinery or apparatus for winding threads. A communication.

1234. John Gedge, of Wellington-street South, Middlesex. Improvements in obtaining a material used in dyeing. A communication.

1235. John Gedge, of Wellington-street South, Middlesex. Improvements in machinery or apparatus for the manufacture of billiard cues or similar articles. A communication.

1237. John Gedge, of Wellington-street South, Middlesex. Improvements in the application of distillation to gas from the furnaces of steam engines. A communication.

1238. George Bell Galloway, of Basinghall-street, London. Improvements in the furnaces of marine boilers, and in the construction of steam vessels.

1239. Thomas Herbert, of Nottingham, lace manufacturer, and Edward Whittaker, of Nottingham, mechanic. An improvement in the manufacture of warp lace fabrics.

1240. John Dixon, of High Bridge, Newcastle-upon-Tyne, engineer. Improvements in apparatus for measuring water and other liquids.

1241. Frederick Peter Dimpfel, of Philadelphia, U. S. Improvements in the construction of screw nuts for axle-boxes, and other purposes. A communication.

Dated May 24, 1856.

1242. John de Cockkenifeck, of Cork, Ireland. An improved process and apparatus for preparing, refining, and filtering oils or fatty matters.

1243. Pierse Eustace Laurence Barron, of Coleshill-street, Middlesex. An improved process for coating metals for sheathing ships and for other purposes, and in the means of attaching sheathing plates to ships or vessels. A communication.

1244. William Illingworth, of Manchester, Lancaster. Certain improvements in printing or colouring and glazing china, earthenware, or other ceramic manufactures, and in the machinery or apparatus connected therewith, and also improvements in the subsequent treatment of such manufactures.

1246. Robert Adam Whytlaw and Alexander Mitchell, of Glasgow, Lanark, N.B., manufacturers. Improvements in weaving.

1247. James Lea, of Birmingham, Warwick. Improvements in sunblinds.

1248. Frederick Peter Dimpfel, of Philadelphia, U. S. Improvements in the construction of steam boilers and furnaces.

1249. Samuel Davey Liptrap, of Albany-road, Camberwell, and James Wright, of Alfred-place, Newington Causeway, Surrey. Improvements in apparatus for regulating the mode of supplying and drawing off water and other liquids.

Dated May 26, 1856.

1250. Benjamin Nadault de Buffon, of Rue du Cherche Midi, Paris, France. A new apparatus for clarifying and purifying water and other liquids.

1252. Alphonse René Le Mire de Normandy, of Judd-street, Brunswick-square, Middlesex. Improvements in obtaining fresh water from salt water.

1253. Wharton Rye, of Manchester, Lancaster, iron founder. Certain improvements in fixing or fastening rails or railways in their chairs.

1254. William Hulse, of Birmingham, Warwick, smith. An improvement or improvements in metallic and other bedsteads, which improvement or improvements may be applied to other articles of furniture, and to framework generally.

1255. Charles Cowper, of Southampton-buildings, Chancery-lane, Middlesex. Improvements in the treatment of coal, and in the purification, desiccation, and agglomeration of coal, and in machinery and apparatus for such purposes. A communication.

1256. Bennett Johns Heywood, of Leicester-square, Middlesex, gentleman. Improvements in holders for leads, slate, and other marking materials.

1257. Frederick Charles Jeune, of Gresham-street, London, India-rubber manufacturer. An improved manufacture of floor-cloth.

1258. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. An improvement applicable to quadrants and other instruments for taking the altitude of the sun or other objects. A communication.

1259. Thomas Foster, of Brownlow-street, Middlesex, turner. Improved apparatus for holding postage, receipt, and other stamps.

1260. Samuel Newington, of Ticehurst, Sussex, doctor of medicine. A preparation for destroying the fly or aphis, and other insects, on hop and other plants.

1261. John Roberts, of Falmouth, builder. Improvements in machinery for moulding bricks and tiles.

1262. Thomas Charlton, of Brentwood, Essex, engineer, and William Turnbull, of Rotherhithe, Surrey, engineer. Improvements in steam engines.

1263. James Baird, of Edinburgh, wool merchant. A method of freeing the wool upon skins from burrs and other extraneous substances.

1264. Henry George Yates, of East Smithfield, Middlesex, gentleman. An improvement in treating wash waters in order to precipitate the greasy and soapy matters contained therein. A communication.

Dated May 27, 1856.

1265. Ebenezer Talbot, of Spring Vale, Staffordshire, manager. Improvements in the construction of rails for railways.

1266. Frank Clarke Hills, of Deptford, Kent, manufacturing chemist. Improvements in the purification of gas.

1267. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in printing machinery. A communication.

1269. Frederick Peter Dimpfel, of Philadelphia, United States, engineer. Improvements in constructing the permanent way of railroads.

NOTICE OF APPLICATION FOR PROLONGATION OF PATENT.

A petition will be presented to Her Majesty in council, by Thomas Cardwell, of Bombay, merchant, praying Her Majesty to grant a prolongation of the letters patent granted to him on the 15th December, 1842, for "Improvements in the construction of presses for compressing cotton and other articles."

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1288. William Needham and James Kite (secundus), of Vauxhall, Surrey, engineers. Improvements in machinery or apparatus for expressing liquids or moisture from substances.

NOTICE OF APPLICATION FOR LEAVE TO ENTER DISCLAIMER.

A petition has been presented to the Solicitor General for leave to enter a disclaimer to the specification of the following patents:

Samuel Cunliffe Lister, of Manningham, near Bradford, York, and George Edmond Donisthorp, of Leeds, bearing the title, Improvements in preparing and combing wool and other fibrous materials. Date of patent 20th March, 1850.

Samuel Cunliffe Lister and James Ambler, both of Manningham, York. Improvements in preparing and combing wool and other fibrous materials. 2nd February, 1852.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," June* 10*th*, 1856.)

257. Henry Holford and Mark Mason. Improvements in machinery or apparatus for compressing metals and for manufacturing all kinds of metallic rivets, bolts, or similar articles.

271. Allan Macpherson. Improvements in obtaining and applying motive power. A communication.

275. George Holcroft, Joseph Smith, and Thomas Holcroft. Improvements in machinery for preparing, spinning, and doubling cotton and other fibrous materials.

282. George Norgate Hooper and William Hooper. Improvements in springs for carriages, and for the cushions of carriages, chairs, mattresses, beds, and other similar articles.

285. Auguste Eugène Dannequin. Certain improvements in caoutchouc or any other waterproof garments.

289. James Townsend Ward. A new or improved omnibus.

298. Ralph Waller. Improvements in machinery for preparing cotton and other fibrous materials.

310. Michael Leopold Parnell. An improvement in the construction of locks.

314. Alexander McDougall. Improvements in treating bones, other animal matters, and other substances containing phosphates, for the purpose of obtaining manure and other products.

322. John Inshaw. A new or improved pressure gauge.

327. James Edward Duyck. Improvements in the manufacture of oil-cake.

332. William Kenworthy. Certain improvements in self-acting mules.

367. Richard Knight. Improvements in medical chests.

379. Stephen Rossin Parkhurst. Improvements in sails and rigging for vessels.

392. Alexandre Tolhausen. A machine for cutting articles of polygonal figure in wood or other material. A communication.

490. James Steedman. An improvement in pianofortes.

542. John Aspinall. Improvements in machinery for curing sugar or extracting moisture therefrom, applicable to separating liquids from solids.

548. Richard Archibald Brooman. An improved fabric suitable for ladies' garments. A communication.

801. James Samuel and John Nicholson. Improvements in steam and other vapour engines.

1029. Henry Mapple. Barometers.

1053. Henry Duncan Preston Cunningham. Certain apparatus to be applied to boats to increase their buoyancy and stability.

1098. William Edward Wiley. Improvements in the manufacture of pens and pen-holders.

1099. William Basford. Improvements in apparatus for purifying coal gas.

1113. Bartholomew Beniowski. Improvements in typographical composition, and in the manufacture of logotypes to be used therein.

1179. John Wilkes, Thomas Wilkes, and Gilbert Wilkes. A new or improved manufacture of rollers or cylinders for printing fabrics.

1195. William Edward Newton. Improvements in the process of manufacturing oil from seeds, and in the machinery and apparatus to be used therein. A communication.

1205. James Holdin and William John Dorning. Improvements in bouking, bleaching, washing, and cleansing textile fabrics and materials. Partly a communication.

1208. Rudolph Hermann Schwabe. Improvements in the manufacture or production of ornamental fabrics.

1209. Macleroy Neilson. Improvements in the treatment, preparation, or finishing of yarns or threads.

1213. Edward Hammond Bentall. Improved machinery for crushing or splitting grain or seeds. A communication.

1219. John Charles Pearce. Improvements in apparatus for generating and economising steam.

1223. Job Cutler. Improvements in the manufacture of metallic pipes or tubes to be used for various purposes.

1267. William Edward Newton. Improvements in printing machinery. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

1853.

1391. Christopher Nickles and James Hobson.
1404. John Horrocks and James Dunlop Horrocks.
1409. Claude Arnoux.
1416. James Robert Napier and William John Macquorn Rankine.
1422. Richard Archibald Brooman.
1445. Arthur Parsey.

LIST OF SEALED PATENTS.

Sealed June 6, 1856.

2621. George Senior Tolson, Robert Henry Tolson, Joseph Senior Tolson, and Thomas Irving.
2741. Jonas Marland and Samuel Marland.
2743. William George Wilson.
2751. Thomas Chaffer and Jonah Ellis.
2752. Johannes Neuenschwander.
2758. Jean Joseph Emilien François Kuister.
2809. Robert Midgley and George Collier.
2871. Richard Ruston.
2897. Charles Glover.
2919. Alexandre Tolhausen.
2934. John Robinson, Richard Cunliffe, and Joseph Anthony Collet.
2950. Thomas Holmes.
63. Peter Armand Lecomte de Fontainemoreau.
84. Thomas Charles Clarkson.
269. Thomas Hurst.

270. John Henry Johnson.
572. David Brown and William Brown.
604. George Murray.
650. Lazare Ochs.
720. Thomas Barnabas Daft.
731. Joseph Tall.
770. Benjamin Looker.
776. Henry Cornforth.

Sealed June 10, 1856.

2780. John Hall.
2784. David Parsons.
2790. Bernard Hughes.
2791. Bernard Hughes.
2793. Jean Marie Préaud.
2806. Martin Billing and Walter George Whitehead.
2814. David Hart.
2823. John Walter Friend.
2827. Charles John Todd and Robert Pinkney.
2829. Peter Haworth and Alexander Forrest.
2833. John Aspinall.
2834. Edward Brown Hutchinson.
2836. George Coats.
2842. Paul Marie Salomon, Jacques Loir Montgazan, and Charles Marie Joseph de Flers.
2844. George Collier, John Crossley, and James William Crossley.
2846. Henry Stewart.
2847. John Lobb Jeffree.
2870. George Ross and Thomas Wilkes.
2887. David Dunne Kyle.
2899. John Gedge.
2901. James Newman and William Whittle.
2932. John Grist.
2942. Lewis Harrop, Samuel Barlow, and Alexander Boyd.
2951. William Edward Newton.
33. Robert Grey.
206. William Owen.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

CONTENTS OF THIS NUMBER.

American Machine for Making Hollow Bricks (*with an engraving*) 553
Merchant Shipping Registration Act 554
On Large Bells and Bell Machinery (*continued from page* 509) 559
Tolson's Cloth Patent 562
Cope and Collinson's Improved Lock (*with engravings*) 563
Marcus and Taylor's Draught-Regulator for Furnaces (*with an engraving*) 564
The Hobbs Lock Picked 564
"Health, Work, and Play." By Dr. Acland, F.R.S. 565
Woodcock's Furnace 565
Mechanical Locomotion 565

Specifications of Patents recently Filed:

Glass	Disinfecting	567
Statham	Telegraph Cables	567
Graham	Paper-hanging	567
Wagstaff	Seamless Garment	567
Stirling	Coating Metals	567
Smith	Bedsteads	567
Tatham	Fibrous Substances	567
Gilbee	Hardening Stones	568
Smith	Sewing Machines	568
Giller	Shades for Gas-lights	568
Field and Jeffreys	Railway Chairs	568
Craven and Pickles	Weaving	568
Massip	Hat Linings	568
Parant	Millstones	568
Dodge	Spreading Compositions	568
Valentine, Foster, and Haworth	Power Looms	568
Whitaker	Sewing Machines	569
Woodrow	Shirts	569
Teall	Fatty Substances	569
Parkes	Oils	569
M'Glashan & Field	Printing Presses	569
Lenny	Carriages	569
Scully & Heywood	Ticket Holders	569
Gregory and Jillings	Water Closets	570
Bellamy	Ornamenting Surfaces	570
Roberts and Dale	Stiffening Substances	570
Richardson	Glass and Clay-ware	570
Shears	Powder Cases	570
Newton	Rope and Cordage	570
Smith	Alarm Signals	570
Rives	Looms	571
Healey, Foster, and Lowe	Working Metals	571

Provisional Specifications not Proceeded with:

Elce	Self-acting Mules	571
Smith	Grinding Grain	571
Gaudibert	Guard for Watches, &c.	571
Wilson	Grinding Grain	571
Oppenheimer	Stretching Piled Goods	571
Collier, Bailey, and Horsfall	Drying Wool, &c.	572
Weber	Motive Power	572
Bevan	Projectiles	572

Provisional Protections 572
Notice of Application for Prolongation of Patent 574
Patent Applied for with Complete Specification 574
Notice of Application for Leave to Enter Disclaimer 574
Notices of Intention to Proceed 575
Patents on which the Third Year's Stamp-Duty has been Paid 575
List of Sealed Patents 575

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1715.] SATURDAY, JUNE 21, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

PUMPING ENGINES.

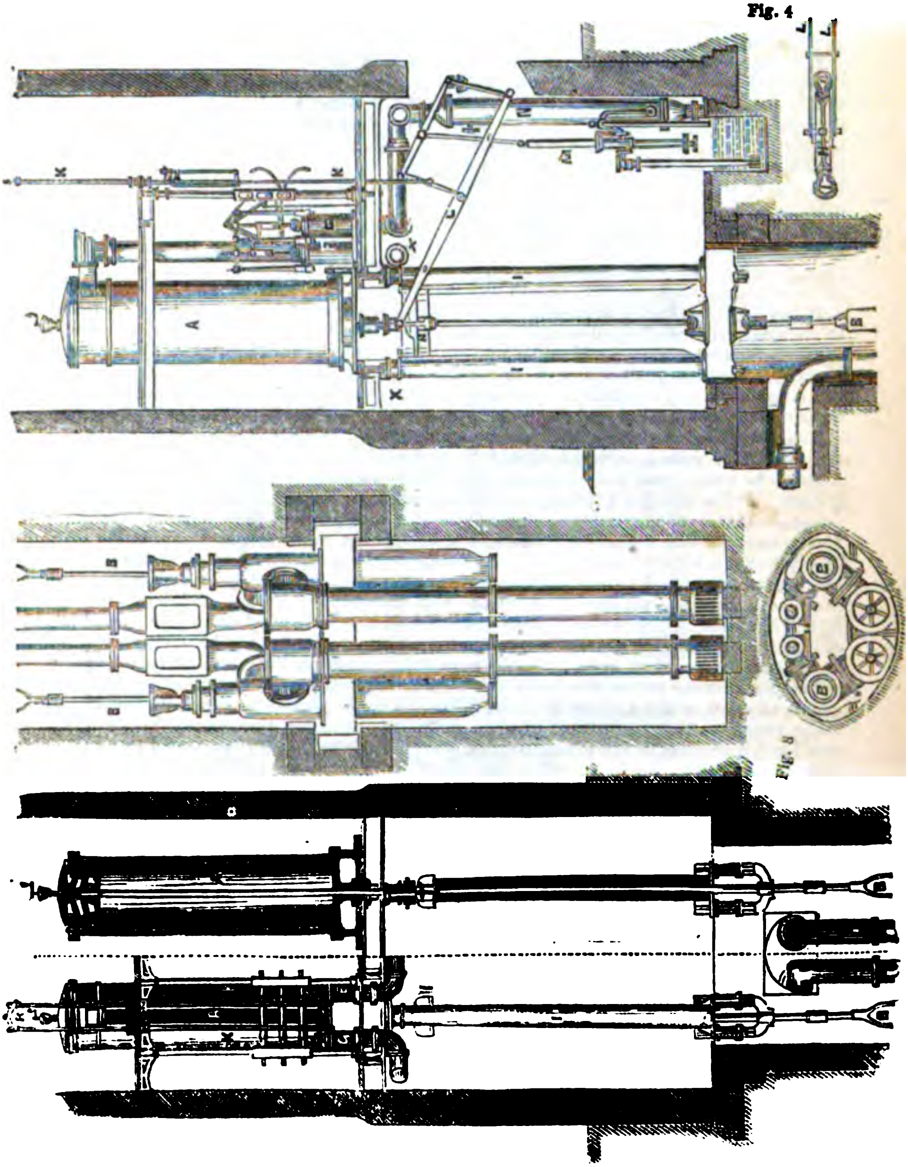
Fig. 4

Fig. 3.

Fig. 6.

Fig. 8

Fig. 5.



PUMPING ENGINES.

A DESCRIPTION OF THE PUMPING ENGINES OF THE WOLVERHAMPTON WATER WORKS, WITH SOME REMARKS ON WATER PUMPING.*

BY MR. HENRY MARTEN, OF WOLVERHAMPTON.

THE engines described in the present paper have been at work some years. They consist of a pair of engines at Tettenhall, constructed from the designs of Mr. Thomas Wicksteed, M.I.C.E., and erected in 1847, by Mr. James Kay, of Bury; and also an engine at Goldthorne Hill, constructed in 1851, by Messrs. Hawthorn, of Newcastle-on-Tyne, members of this institution.

The engines at Tettenhall are single direct-action non-condensing engines, and are shown in the general view, figs. 1 and 2 of the accompanying engravings, to a small scale, and in detail to a larger scale, in figs. 3 to 9; fig. 3 being a side elevation, fig. 4 a plan through *xx* of fig. 3, fig. 5 a transverse section, fig. 6 an elevation of the pumps, fig. 7 a section through the valves, fig. 8 a plan of the same, and fig. 9 the delivery valve. The cylinders, A A, are 36 inches diameter, and 9 feet 6 inches stroke. The plunger pumps, B B, fig. 6, are 13 inches diameter, lifting about 300 feet. The steam is admitted to the cylinder at a pressure of about 35 lbs., and cut off at two-thirds of the stroke. The boilers are cylindrical, two in number, 26 feet long, and 6 feet diameter, with two tubes in each, 25½ inches diameter, and internal fires. The flame from each fireplace passes along the tube, thence round to the front again by the side of the boiler next to its tube, and thence the two uniting pass along the bottom into the chimney.

It has been found in practice that the two smaller tubes are in every respect preferable to the single one, as they allow more steam room, better heating surface, and afford convenience for cleaning all round under the bottom; and by permitting the water level to be nearer the centre of the boiler shell, they admit of a larger water surface for the delivery of the steam as it is generated in the water, so that the ebullition is less violent, and the formation of steam more rapid.

The boilers are covered with loam or moulding sand to a depth of about 6 inches over the top. This substance, which should be protected by a roof from being blown away, is found to be a very good non-conductor, very little heat radiating through it to the upper surface. It has also this advantage over nearly all other materials employed for the same purpose—that no condensation can take place in it within two or three inches of the boiler plates, since for that distance it forms a sand bath as hot as the steam, which, in the event of any leakage, blows through it dry, and consequently no corrosive action upon the plates can take place. Condensation cannot occur until at a distance of three or four inches from the plates, spreading thence very gradually with the escape of the vapour towards the surface of the sand, where a moist patch is observed, indicative of what is going on below. With a material of this description, any portion of the boiler top can be uncovered with a shovel, and examined at once. For the purpose of experiment at Tettenhall, steam blows at two places in the boilers covered in this manner were suffered to remain unrepaired for a couple of years, in order to try the effect fully, and the result was an entire absence of corrosive action, as described above. In the opinion of the writer, loam sand is much preferable for this purpose to any other material, provided always that it is protected by a roof or covering. It is much cheaper than felt, brick, or iron casing, and the plates are much more readily inspected than with the latter coverings. It is also much superior to furnace ashes, cinders, or riddlings, which are often placed over boilers, as these substances frequently contain acids and other chemical impurities, which, on being brought into contact with waste steam, act very injuriously on wrought iron. In some situations the author has seen plates nearly eaten through from improper coverings of this description.

In the pump work, shown in figs. 6, 7, and 8, there is little requiring special notice: the valves are ring valves, rising on a central spindle, as shown in fig. 9; they are of cast iron galvanized, beating on wooden faces. Originally they beat upon a mixture of lead and tin, but this soon became loose in the seating, and leaked; oak was then tried, but the acid peculiar to this wood corroded the cast iron, so that these beats were obliged to be discontinued. Lancewood, box, and beech have also been tried, but nothing answers so well as holly, which is now employed, and continues to work well.

The area of the suction valve, C, is 325 square inches, being about two and a half times the area of the plunger, and that of the delivery valve, D, is 163 square inches, or about one and one-third times the area of the plunger. The enlargement of the suction valve to this extent is found to be very serviceable where the velocity of the plunger is likely to be great in the ascending stroke.

* Read at the Institution of Mechanical Engineers, Birmingham.

The steam valve, E, the equilibrium valve, F, and the exhaust valve, G, are of gun metal, and on the double-beat construction. Their areas are as follows:

Steam valve . . .	50 square inches	=1-20th of area of cylinder.
Equilibrium valve .	50 ,,	=1-20th ,,
Exhaust valve . .	78 ,,	=1-13th ,,

The piston rod and pump rod are connected with a cross head, H, working on V slides attached to the supporting columns, I, figs. 2 and 3. The plug rod, K, and the valve

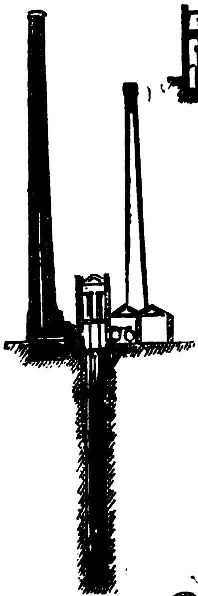


Fig. 1.

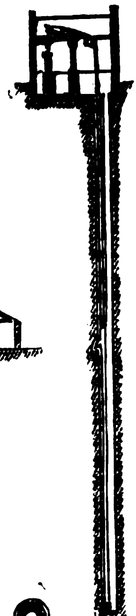


Fig. 10.

Fig. 11.

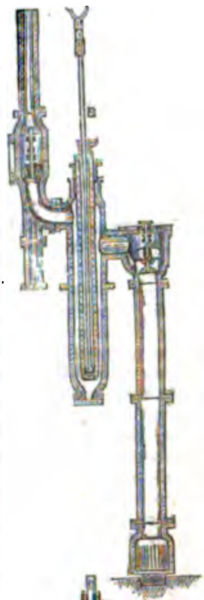


Fig. 7.

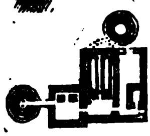


Fig. 2.

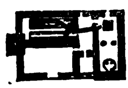


Fig. 12.

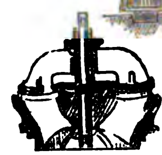


Fig. 9.

motion are worked from a slight wrought-iron beam, L, under the cylinder floor, connected at one end to the cross head, H, and at the other end slung to parallel links. The feed pump, M, is also attached to this beam. The water for the feed is passed through a heater, N, situated in the corner of the engine house, and formed by an enlargement of the waste steam pipe, 1 foot 6 inches diameter, along the centre of which for some distance the feed pipe is conducted, occupying about two-thirds the area of the heater.

The engine is regulated by a water cataract governed by a small ratchet wheel and screw. The number of strokes per minute varies from three or four to ten or eleven, the average speed of the piston being 130 feet to 140 feet per minute; the quantity of water delivered per stroke is 56 gallons. The area of the plunger is 132 square inches, and the pressure on the bottom of the plunger is 180 lbs. per square inch, making a total dead load of 17,160 lbs., equal to a dead pressure of 16¾ lbs. per square inch on the surface of the steam piston.

These engines are working for their kind at a fair duty, performing about 27,000,000 lbs. lifted 1 foot high per minute, with a consumption of 1 cwt. of the small common slack of the neighbourhood. With Newcastle or Welsh small coal they would perform a duty of 36,000,000 lbs.

The engine at Goldthorn Hill, shown in the general view to a small scale, figs. 10, 11, and 12 (the latter being a plan), is given merely as a sample of a good useful pumping engine fitted for this neighbourhood. It is a low-pressure condensing beam engine; the cylinder is 48 inches diameter, with an 8 feet stroke; the boilers are 30 feet long, and 7 feet diameter, with two tubes, 2 feet diameter beyond the furnace, and 2 feet by 2 feet 4 inches at the fire-places. The pressure of the steam is about 15 lbs. per square inch. The boilers are clothed with felt and wood lagging, which was completed before the experiments with loam sand had been tried.

To avoid the almost constant trouble which arises from leakage at the steam valves on the boiler tops from the expansion and contraction of the main range of steam pipes, Mr. Hawthorn suggested that the main steam pipe should be conducted to the steam chest with a quadrant curve, as shown in the plan, fig. 12, so as to allow the two extremities connected with the steam nozzles a considerable amount of expansion and contraction, without a thrust sufficient to break any joints; and the writer has pleasure in stating that this arrangement has been completely successful, as there has not been the slightest leak either at the nozzles or steam chest. This arrangement is useful and efficient where there is one steam pipe leading off from between two boilers; where, however, the steam pipe leads off from one side, or where there is a range of more than two boilers, it is not applicable; and in these latter cases the writer has found no expansion joint so simple and effective as the wrought-iron diaphragm joint, consisting of a couple of circular wrought-iron plates, about 2½ times the diameter of the pipe, bellied about 3 inches, and rivetted together at the outer rim and to flanges on the main range of steam pipe.

There is another point of detail in connection with the boilers to which the writer would wish to call attention, as it is useful, though frequently overlooked. The hot and cold feed and blow off are all led into and out of the boiler through the same pipe; this arrangement avoids the numerous holes usually cut into boilers for these purposes, and any impurity which may enter the boiler with the hot and cold feed is deposited in close proximity to the blow off. In the present instance, the pipe is of wrought iron, and is rivetted on to the underside of the front end of the boiler, and the arrangement of the valves is somewhat similar to those of a bath, where the hot, cold, and outlet valves all take off the same pipe.

It is also important that the feed should enter the coldest portion of a boiler, which from the action of the currents in those with internal flues is just under the fire grate. When attention is not bestowed on this point, it frequently happens that seams and rivets leak from the sudden changes of temperature to which they are liable.

The boilers are flat ended, and have no stays, but there are three stout T irons rivetted on to the flat plates forming the ends, so as to stiffen them against the pressure. This remark applies also to the boilers at Tettenhall, which are flat ended, with T irons of the same description, working under a pressure of 35 lbs. per square inch.

The writer's experience has led him to the conclusion, that, as a general rule and as far as circumstances will possibly permit, all boilers should be so constructed as to require no artificial support from stays; these tend to pull a boiler out of shape, loosen rivets, and are difficult effectually to fasten or repair; flaws are not readily detected in them, and often when their services are most required they give way from hidden corrosions, or else they strain the boiler so as seriously to damage it, if not fixed exactly in the direction of the line of tension.

The pumps at Goldthorn Hill draw the water from a well about 90 yards deep, and this depth is divided into two lifts of about 45 yards each; the diameter of the bottom working barrel is 14 ins., and that of the top 13½ ins. The valves are ring valves of gun metal, with gun metal seats. The average speed of the piston is 100 feet per minute, and the quantity of water raised per stroke is 48 gallons; the total dead pressure is 19,305 lbs., equal to 130 lbs. per square inch of area of the working barrel, and to 10½ lbs. per square inch of surface of the piston. The steam is cut off at about half stroke; the steam equilibrium, and exhaust valves are double-beat gun metal valves, and their sizes are as follows:

Steam valve . .	51	square inches	=1·36th of area of cylinder.
Equilibrium valve	51	„	=1·36th of area of cylinder.
Exhaust valve . .	64	„	=1·28th of area of cylinder.

The duty of the engine averages about 40,000,000 lbs. raised one foot high per minute, with 1 cwt. of slack.

(*To be continued.*)

MECHANICAL LIMBS.

ON THE MEANS OF SUPPLYING SOME OF THE USES OF A LOST HAND, BY MECHANICAL ARRANGEMENTS.

BY SIR GEORGE CAYLEY, BART.

IN the year 1845, there was reprinted from the *Mechanics' Magazine* for March in that year, a description of some artificial hands for private distribution. These were used by several persons; and although they thus obtained the means of a voluntary grasp and release of such objects as they required to handle, as then exhibited in the Polytechnic Institution, by Mr. George Dousland, for whose benefit this invention was originally designed; yet ultimately, the trouble of putting on and off, together with the weight of the apparatus, though reduced to its lowest possible limits, rendered it irksome to the wearers, and, after the novelty was worn off, they generally preferred making what use they could of the maimed limb, without the apparatus.

Since that time, a more efficient and much lighter construction has been effected; and as those so made, have been approved of, it may be useful to publish a description of this improved apparatus under the sanction of experience, though when first invented, it was in its main features given in the pages of the *Mechanics' Magazine*.

Another cause that operates strongly against the introduction of mechanical

Fig. 1. Fig. 2. Fig. 3.

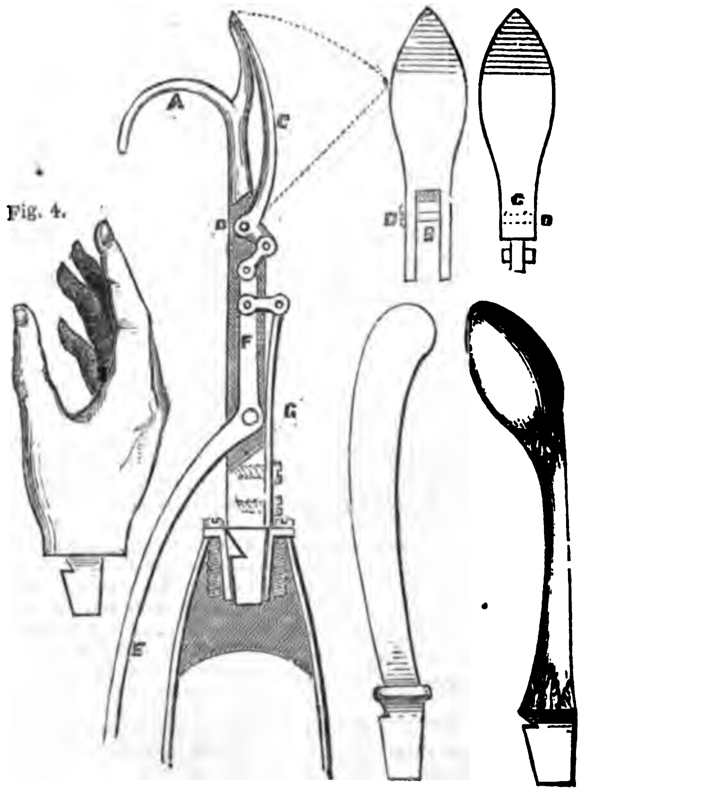


Fig. 5 Fig. 6

hands, is the strong desire in most persons not to appear maimed. They prefer a well made cork hand under a glove, to a more clumsy one that can perform some of the most essential offices of the real limb.

The following construction, though possessed of no *beauty*, when applied for *use*, as a self-grasping and releasing apparatus, has the advantages of being, at any moment, changed for an ornamental hand, a knife, fork, spoon, saw, or any other tool that may be required in the same manner as is now frequently used for fixing many carpenter's tools to the same handle, by a spring catch. This will be readily understood by inspecting the engraving, where fig. 1 represents the

construction of the steel hook, and grasping claw, fixed by a catch (not represented, to prevent confusion) into the usual apparatus for holding the stump of the arm.

The apparatus for grasping requires some explanation, though its construction is tolerably evident on inspection. Below the fixed hook, A, the shank is divided, as shown by the shaded part, and more distinctly at B, fig. 2; within this is inserted the moveable shank of the claw, C, figs. 1 and 3, held by the screw-pivot, D, figs. 1, 2 and 3. E, fig. 1, represents a long thin light lever, flattened as it approaches the elbow, to which it must extend. This lever passes under the sleeve, made wide enough to permit it to stand out an inch, or an inch and a half from the arm; the lever is hinged on a pivot screw within the hollow part of the shank, near G, fig. 1, and has a short arm, F, drawn forcibly forward by a flat steel spring, G, and connecting piece, through another connecting rod. This arm opens the claw, C, to receive any required substance within the limits of its range, which is firmly held as long as required by the pressure of the spring, until released by the lever, E, being pressed against the side. About ten pounds pressure of the spring, at the extreme point of the pincers, is found to be a convenient force.

In cases where additional cost is not objectional, this plan of spring grasp may be concealed in, and adapted to a light artificial hand, as shown in fig. 4, for occasional wear, but it will not be found so useful as the steel claw, which enables the wearer to take up even the most minute objects, such as coins, pins, needles, &c., &c. The knife is shown in fig. 5, and the spoon in fig. 6. It can scarcely require any excuse for thus showing the result of the experience obtained on this subject, rendered still more important by the vast accumulation of maimed persons, throughout so many nations, consequent upon the casualties of the late unexampled and most destructive war.

GEORGE CAYLEY.

Brompton, N. R. Yorkshire.
May 12, 1856.

FOREIGN INTELLIGENCE.

Scientific, Engineering, Architectural, &c.

EDUCATION BY "WORK."—Although Germany does not exhibit any signs of external (political) activity, its thoughts and endeavours are great. At the late general meeting of German teachers and schoolmasters, the idea of education by *work* has been put forth in bold relief. The mere being pinned down to the school-benches in a musty, dreary room won't do any more in an age longing after bodily and mental expansion; therefore our Saxon fellow-countrymen on the Elbe and Oder, intend to bring the youth of the people in contact with nature by practical, sturdy, yet pleasant and unexhausting *work* in the garden, the field, and the forest. This *new* idea, however, is exceedingly old, as, according to the precepts of Con-fu-tsee (many centuries before Christ), all children had to do garden work in China. To this our *Governments* ought to grant the lands of the commons, provided they do not object (!) to have healthy, strong men for their citizens. One of the speakers at the above gathering of German schoolmen uttered the apparent paradox, that "all elementary schools could be made *self-supporting*—or, at least, the lads might take bundles of vegetables, fruit, &c., to their homes, with a set of sturdy, healthy limbs and lungs in the bargain."

OPENING OF EUROPEAN COMMERCE TO TIMBUCTOO.—At a period when the English Government have spent large sums to open some secondary channels of African commerce, the opening of the very heart of that continent on another side will be of great importance. The Algiers *Akbahr*, of a recent date, contains the important intelligence that some deputations of Arab tribes, inhabiting the borders of the Great Sahara, have arrived at the French head quarters, and have declared, on the part of their people, that they have become completely convinced of the importance and utility of a commercial intercourse with the Europeans, and that there shall be no impediment laid to commerce being carried on up to Timbuctoo. There can be no doubt that the late military *successes* of the French on the outskirts of the Sahara have much contributed to this change in the policy of African tribes hitherto inimical to it. We shall be happy to find that the commerce of *this* country, availing itself of the present close national alliance between the two nations, will take steps for profiting by this important event.

GIGANTIC ROCK SCULPTURES.—The government of the Swiss Republic have decided on erecting a monument to *Arnold Winkelried*, a peasant, who, when the Austrians intended to coerce Switzerland, and were arrayed in battle, stepped forward, and burying a number of spears stretched forth by the Austrian knights in his own breast, thus opened a *street* to his compatriots. It was obvious, that as this was the solitary, but culminating public action of the sturdy patriot, no statuary monument would do justice to it. Hence, therefore, it has been decided that a gigantic sculpture (*basso relievo*) cut in the very face of a huge rock, like the rock sculptures of Egypt and India, should commemorate the devotion of the Swiss peasant. It may be deemed a fortunate event, that by this attempt, *monumental-*

ism, if we may so speak, will leave the trodden paths of statues and obelisks, and carry, moreover, its productions into open nature—accessible to all, instructive to all.

THORWALDSEN AND KING LOUIS OF BAVARIA.—The following letter, lately brought to light, does honour to the man of the crown and the man of genius: "Dear Thorwaldsen, I perceive with pleasure from your letter, dated October 14th, that my Adonis statue is completed, and I have heard that it will be one of the best works. One of the best works of *Thorwaldsen* means one approaching those of the best of antiquity—and what treasure shall I possess then! ...... Munich has never made such an acquisition as when it shall possess Thorwaldsen's. Will you write me, at the latest, one month after the receipt of this, whether you would accept, next spring, the situation of Professor of Sculpture at the Academy of Fine Arts here? If you were Professor of the Academy, I would ...... also nominate you Councillor of State on extraordinery service. Even my ministers have no higher rank than that of State Councillor. But even if you were merely to take up your abode at Munich as a private individual, in this case also you will be joyously received by all, but with open arms by one who knows how to estimate you. LUDWIG." Such an invitation few would have resisted—but Thorwaldsen was so fettered by Rome, and the many works he had to make there, that he did not go to Munich. Still, whenever king Ludwig came to Rome, he walked always arm in arm with the Danish sculptor.—[*Communicated by Dr. J. Lotsky.*]

BETT'S PATENT METAL CAPSULES.

BEFORE THE JUDICIAL COMMITTEE OF THE PRIVY COUNCIL.

Tuesday, June 17, 1856.

PRESENT.—Mr. Pemberton Leigh, Sir Edward Ryan, Sir J. Patteson, and Sir W. H. Maule.

This was an application, on the part of Messrs. Betts, for the prolongation of a patent granted to their father in 1842 for the manufacture of metal capsules, and their application to the necks of bottles, jars, &c. Other patents have since been obtained which are combined with it. It appeared that by the working of the first patent considerable loss had been sustained, but under the present plan a profit of upwards of £20,000 had been realized. Several witnesses were examined to prove the utility of the invention, among whom was Mr. Feast, a pickle and sauce merchant, who stated that he paid £250 per month for capsules. There was no opposition.

Mr. Hindmarch, Mr. Knowles, and Mr. Millward appeared for the petitioners; Mr. Welsby on the part of the Crown.

Sir E. Ryan said that their Lordships were of opinion that there was no merit in the invention; but if there was, the parties had been sufficiently rewarded.

PREVENTING THE ESCAPE OF ACID VAPOURS.

BY MM. CH. AND AL. TISSIER.

THE process which we apply in this case consists in interposing, between the principal flue and the tall chimney of the manufactory, a species of lime oven, heated by a contiguous furnace, and into which will enter, on the one side, in consequence of the draught, all the vapours from the factory, on the other, the flame of the furnace intended to heat the lime withwhich the oven is filled, a certain temperature being necessary for the complete absorption of the acid gases. It will be clear that the arrangement of the oven may be varied *ad infinitum*; consequently our process consists essentially in the use of lime or carbonate of lime brought to such a temperature that the absorption shall be as complete as possible, the elevation of the temperature aiding at once the draught of the chimney and the absorption of the acid gases.

This process is used at our manufactory at Amfreville near Rouen, where aluminium is at the present time extracted on a very large scale, and it has given excellent results in stopping the acid vapours produced by the manufacture of chloride of aluminium. It is well kown that these vapours, composed of chloride of silicium, chloride of aluminium, chloride of sulphur and hydrochloric acid, are extremely sharp and corrosive, and it is to the interest of all to prevent their escape.—*Comptes Rendus.*

TONNAGE REGISTRATION.

To the Editor of the Mechanics' Magazine.

Woolwich Dockyard, June 17, 1856.

SIR,—It gives me satisfaction to find, by your article on "Tonnage Registration," published in the *Mechanics' Magazine* of the 14th inst., No. 1714, and in the Journal of the Society of Arts of the 13th inst., No. 186, that my letter of the 27th ultimo, in

reply to your review of my paper, "Tonnage Registration," read before the Society of Arts on the 11th January last, has afforded you such a further exposition of my views on the deficiencies of our tonnage registration under the Merchant Shipping Act of 1854, as induces you to "congratulate Mr. Atherton upon the manifest improvement which has taken place in his opinions." Whether, however, this more approximate concurrence of our opinions may be attributable to any change in my views as to the deficiencies of our present tonnage registration system, or to your own clearer perception of what my views really were, and still are, I need not now question. The result is gratifying to me, for every writer on scientific subjects must desire to stand well with the Editor and patrons of the *Mechanics' Magazine;* but I now further desire that our passive concurrence of opinion, embracing as it does the main principles of the case in question, may result in our active co-operation with a view to the amendment of our present shipping registration system, inasmuch as you have distinctly announced and adopted the propositions which constitute the grounds of my exposition of the deficiencies of our present system; namely,

1st. "That the tonnage measurement and registration of vessels has never been fairly brought before Government in any other than a purely fiscal point of view."

2ndly. "That Government, in legislating on tonnage registration, has not contemplated the scientific features of the case, nor those which bear on the sea voyage."

3rdly. "That undoubtedly there is a point beyond which ships cannot be safely loaded."

4thly. "That undoubtedly it would be desirable, if possible, to fix a limit to the degree in which ships may be loaded."

5thly. That as respects the draught of water at which ships leave port, "Let the Board of Trade have, if it so please, properly authorised officers to note and record these facts."

Such being your acknowledgments in your review on my paper on tonnage registration, read before the Society of Arts on the 16th January last, I may surely presume it to be your opinion that the present state of our shipping registration system does not fulfil the statistical requirements of the times; and that the Act of 1854, as respects the matters above referred to, ought to be amended, "if possible."

Now as regards the *possibility* of amending these declared and admitted deficiencies of the Act of 1854, it may depend considerably on the steadfastness of purpose which you, the Editor, and the numerous and influential patrons of the *Mechanics' Magazine*, and the members of the Society of Arts (to whom also you have appealed on this subject), may display in the prosecution of this good cause. It may indeed happen that neither the Editor of the *Mechanics' Magazine*, nor Mr. Atherton, nor any other loyal agitator in this good cause (for in these days of popular education and advancement the correction of deficiency or abuse in any department of national affairs constitutes the very essence of loyalty) may not be so fortunate as to devise, all at once complete, that scheme of statistical registration which, on "consultative deliberation," may be decided upon as practically the best. For my part I have not presumed that such would be the case; but, nevertheless, I have endeavoured to lead attention to the subject by pointing out the glaring deficiencies of the present law, and specifically bringing forward suggestions which I believe would constitute a practicable system; and which, embracing as it would do, the capacity or roomage of ships for bulk of cargo, the capability of ships for carrying weight of cargo, the displacement at a certain specified draught, and the draught at which ships actually leave port either above or below some assigned line, mark, or nail at stem and stern as of old, would, I conceive, constitute a scheme for shipping statistics more in accordance with the requirements of the times than is afforded by the present law. These suggestions, avowedly submitted in deference to further "consultative deliberation" scientifically competent to the task, and biassed by no class-prejudices on the question, are quite in accordance with my original paper; and if these views as to the purport of my paper have not been already noticed by the Editor of the *Mechanics' Magazine*, I hope they may now be regarded as a still further "improvement in Mr. Atherton's opinions," and become the subject of your still further congratulations and adoption as a zealous co-agitator in the cause of shipping registration amendment. If I only obtain the active co-operation of the Editor of the *Mechanics' Magazine*, to the extent of his own declarations as above set forth, I will not quarrel with him, though he claim Captain "Coryphæus" as a convert, instead of acknowledging himself to be a recruit.

Being thus in the amicable mood, I am not disposed (indeed, it would be bad agitation) to disturb our harmony on principles by discussing matters of detail in practice; I may, however, remark on, not discuss, a few points. You question, whether a ship of 1,000 tons register may or may not carry 3,000 tons' *weight* of cargo. My statement was, that a ship of 1,000 tons register

might be so proportioned as to carry 1,500 tons cargo by *weight*, and in addition thereto 1,500 tons of cargo by *measurement*, making altogether, not 3,000 tons of *dead weight* cargo, but 3,000 tons of cargo chargeable for freight. The cellular principle of build now adopted in iron ships would easily realize these limits, and the tonnage admeasurement of steamers is evidently open to still more anomalous results, as their register tonnage has no limited ratio whatever to their external displacement.

You appear to infer that I especially advocate external measurement: the first object of my original paper was to expose the fallacy of basing shipping registration on internal roomage only, as by the Act of 1854. I admit that, of the two, I would prefer a scheme of registration based on external displacement to a scheme based on internal roomage. I advocate neither exclusively, but I assert that shipping registration always must be a vexed question so long as the legislature are imposed upon as they always hitherto have been, with the idea that it is a question between *external* and *internal* measurement. Shipping registration never can be complete until some cognizance be taken of the measurements both internal and external; and by reference to the "Table of Details for Record," given in my original paper, read before the Society of Arts, on the 16th of January, it will be seen that the scheme of measurement proposed by me is quite as complete for determining the *internal* roomage or capacity of the ship for bulk or cargo as it is for determining the *external* displacement or capability of the ship for *weight* of cargo. Your notions as to my views in this respect appear to have been completely at fault; but I hope that, by this explanation, I have now established a concurrence of opinion between us as to the much vexed question of external and internal measurement.

I must also notice another point of importance, namely, the determination of the loading limit. At present, every ship receiving cargo has her load limits, on which safety at sea so much depends, determined by interested parties. My argument is, that it ought to be determined by disinterested parties; and as you have now expressly disclaimed the impossibility of fixing a limit for each mercantile ship, I presume that you will *concede* the possibility of doing so. In my paper I left the mode of effecting this object an open question for "consultative deliberation;" suggesting, however, that the breadth of beam conjointly with the angle at which ships, according to their build, are liable to lie over, might be made the base of the investigation. You have suggested that the ratio of length to breadth be also made an element in the calculation, in which I concur. Other ingenious suggestions may also present themselves; so that it is to be hoped that "consultative deliberation" will overcome this stumbling block, so lately an impossibility, but now merely a *difficulty*, and perhaps by this day twelve months a simple question of proportion. As to the question of levying tolls fairly, on what principle are we to judge? Is it to be the *gross* size of the ship, or is it to be its capability for carrying cargo that is to be the measure of fairness? A steamer of 100 tons register tonnage may be ten times as big, cubically, as a sailing vessel of the same register tonnage. Is it fair to exact the same amount of fiscal tolls from each, as is done by the present law? As to the capability for carrying cargo, it is, I believe, statistically known that the tonnage freight by *weight* and the tonnage freight by *measure* are about equal; and seeing that the roomage of a ship for carrying bulk tonnage is no measure whatever of the capability of a ship for carrying weight tonnage, unless submerged deck awash, which you repudiate, it cannot be said, on this principle, that the levying of tolls is fairly based on internal roomage alone. Would not the capability for weight cargo be, at least equally fair; and would not the medium between the cargo *roomage* tonnage and the cargo *weight* tonnage be, on the general average, fairer than either; or would not a direct toll on the goods be fairest of all? Here, again, is a case for "consultative deliberation."

As regards measurement by Sterling's rule, I am reluctant to say more on that subject, since you yourself have so elaborately expounded it, and referred it to the judgment of the readers of the *Mechanics' Magazine;* and as respects Peake's system of admeasurement, based on the curve of vertical sections, I dare say that Mr. Peake will himself publish it more fully than has hitherto been done; and if I may be permitted to judge from your exposition thereof, I have no doubt it will be more highly appreciated by you when better understood, than it appears to be at present. The constructive elements to be measured for determining shipping registration must necessarily be specified and prescribed by law; but for my own part, I see no reason why Sterling's rule should be imposed by Act of Parliament on shipping as the *mode* of working out a calculation any more than that it should be imposed on land surveying, or other purposes for which it is applicable. There is no more mystery necessarily connected with the measurement of a ship than

there is with the measurement of a tub. Why should it not be left to those who are responsible for calculations being correctly done to adopt Sterling's rule, or Peake's method, or any other of the various methods that may be in approved general use, and recognized as scientifically admissible for the purpose required? Is science likely to be promoted by legislative protection? Here again is a case for "consultative deliberation."

I trust that the Editor of the *Mechanics' Magazine* will now recognize a still further "manifest improvement in Mr. Atherton's opinions," and take a decisive part, either in upholding our shipping registration system as it now is, or declare himself an advocate for its amendment. The patrons of the *Mechanics' Magazine* may wish to know the decision of its Editor, and is not such decision due to them and to this public cause?

I am, Sir, yours, &c.,
CHARLES ATHERTON.

To the Editor of the Mechanics' Magazine.

SIR,—In the last part of your observations on tonnage registration (*Mechanics' Magazine*, pp. 558, 559), you have noticed a method of calculation that has been practised by me for many years with perfect success. That you have been "grievously misinformed" there can be no doubt, for from page 15 of the small work alluded to (being Weale's first part of the "Rudimentary Treatise on Naval Architecture") to the end of that little work there will be found no restriction to the curvilinear portions of the sectional areas being divided into triangles and curvilinear areas to any extent, leaving no deficiency in measurement; and "*to obtain the greatest distance between the two chords and the curve by trial*" is evidently a matter of manipulation.

I can assure you, that since the year 1829, this measurement, based on the curve of sectional areas, has been used by me for all classes of vessels—from line-of-battle ships to fishing boats. Those results are at the service of the Editor of the *Mechanics' Magazine*, and confidence is felt in his desire to promulgate truth.

It is not intended beyond this notice of your review, to enter the arena of discussion; the public can and will judge for themselves, and to them let it be left. You certainly did not fully apprehend page 15 of Weale's Treatise, and in order that your wish "to have our error pointed out" may be realized, a copy of my method of calculation has been forwarded for your perusal, and for such remarks as you may please to publish thereon.

JAMES PEAKE,
Assistant Master Shipwright.

H. M. Dockyard, Woolwich,
June 16, 1856.

A very few words will suffice by way of reply to Mr. Atherton's letter which we have just inserted. It is a matter of very little importance, as affecting the main question at issue, whether Mr. Atherton has really been driven to occupy a different position, or whether we, in common with the great majority of those who have felt an interest in the question, have hitherto misapprehended his views, and are now for the first time acquiring a tolerable acquaintance with their true import. For this misapprehension, if such it be, Mr. Atherton has no one to blame but himself. In the original essay which has given rise to all this discussion, he attacked with such an amount of vigour what it *now* appears were not vital deficiencies of the present system of registration, but merely matters of inferior moment, and sought to substantiate with such a degree of earnestness what are *now* represented to be the real principles of the essay, and also the several details of the system to be substituted, that it is no wonder that the public in general, not possessing the clue to the labyrinth which Mr. Atherton himself possessed in the inmost recesses of his mind, made a fatal confusion between the *essentials* and *non-essentials* of the new system.

Mr. Atherton ought to feel himself under deep obligations to us for having furnished him the opportunity of explaining this important distinction. And, notwithstanding his good-humoured deprecations, we really do congratulate him on the number of points which seemed to us, and to the uninitiated in general, settled in the new system, but which are now consigned to the more uncertain regions of "consultative deliberation." However, as we said, it is a matter of little moment whether Mr. Atherton or ourselves appear in the character of converts and recruits. In the same spirit in which he has come forward in his last letter we are willing to meet him.

With regard to the enormous difference of real carrying capacity which Mr. Atherton tells us may very well exist between two ships of the same nominal registration of 1,000 tons, we think he has done well in restricting his observations to the case of the vessel which he supposes may well afford to carry 3,000 tons of *dead weight* cargo, and in omitting altogether the case of the unfortunate vessel which cannot get beyond its 500 tons.

The cellular principle of build will doubtless admit of a great difference between the external and internal *displacement* of a vessel; but it is much to be questioned whether the disadvantages of this disproportion are not so much greater than the advantages as to render the internal measurement of the tonnage fair in a fiscal point of view. Merchants are much more anxious to obtain a vessel that will carry a great bulk, with comparatively small weight, than one that will carry a great weight with little bulk; for the greater part of cargoes of goods—especially the more valuable kind—are specifically *lighter*, not *heavier* than water; and internal roomage is, on the whole, in a commercial point of view, more valuable than external displacement. We fully expected that Mr. Atherton would refer to the cellularly-built iron ships as cases in point. But we really believe the great disproportion of the internal to the external measurement of the leviathan ship now building on that principle, will be felt by the owners as a great mischief; they will, of course, wish to carry a mixed average cargo; and to *fill* their hold with a heavy cargo would neither be very practicable nor conducive to their own interests. We believe that to charge them with dues for more than the internal roomage would be unjust.

On the other hand, be it remembered that the *internal* roomage divided by 100 is the legal tonnage of a vessel: 35 cubic feet of sea-water weigh a ton; consequently, 1,000 tons of dead weight carried aboard a vessel of 1,000 tons registered tonnage, would only cause a displacement of 35,000 cubic feet, whereas the whole *internal* (not external) roomage is 100,000 cubic feet. We are certainly, therefore, well within bounds when we assert that there can be no doubt that every ship of 1,000 tons register may fairly be expected to carry at least 1,000 tons weight of goods.

We have offered no opinion on the mode in which the allowance is made for the space occupied by the engine and boilers on board steam-vessels by the present law, nor on the justice and propriety of making this allowance at all. We believe the owners of sailing vessels generally feel this part of the law as a great grievance; and we are, on the whole, disposed to concur in this opinion, which seems also to have been shared by the Tonnage Commission of 1849.

The legislature have undoubtedly always looked upon tonnage registration simply from a fiscal point of view; and by removing all temptation to owners to procure vessels to be built of a bad form—as they have certainly done by the new law—they have rendered an essential service to the cause of science which it were ungrateful to deny or overlook, still more to treat as a misdemeanour and a crime.

Mr. Atherton states that our notions as to his views on the question of external *versus* internal measurement for tonnage have been completely at fault, and he expresses a hope that by his explanation he has now established a concurrence of opinion between us. As we hear no more of his French mode of measurement for fiscal purposes, and of his continued product of two external dimensions and one internal, corrected by an empirical factor, which, together with the whole *detail* of the new system of measurement he proposes, is consigned to the regions of "consultative deliberation," this may possibly be the case.

Of this, however, let him be assured, that we, in common with all the practical men who have spoken out on this question, are satisfied that the levying of dues and tolls on the nominal tonnage, calculated in accordance with the law of 1854, is as fair as can reasonably be expected, and that we will be no parties to any agitation which may have for its object the repeal of the rule as now by law enforced. We are satisfied that a "reasonably fair enactment" being now in force, infinite harm will be the result of any serious attempt to unsettle it; and all the advantage which some enthusiasts anticipate from a change would be found futile.

If, therefore, we consent to follow the

guiding of "Coryphæus, the agitator" (and we by no means wish to decry all agitation as an evil), and give in our adherence to the principle of remitting any questions connected with shipping registration to the action of "consultative deliberation," they must be entirely by way of *addition* to—not of *alteration* of—the registration clauses of the Merchant Shipping Act, so far, that is, as sailing ships are concerned. We should have no objection to see—or rather we should say we should see with satisfaction—a competent committee appointed by the Government,—or by the British Association, or some other scientific society in the first instance, with a view of ultimately, if need be, acting on the Government,—to take into consideration the following points:

1. Whether, it being conceded that there is a limit beyond which it is dangerous to load ships, it is *possible* to assign that limit for every ship by interference of Government, without running unnecessary risk of limiting or cramping the progress of naval architecture, or inflicting commercial injury.

2. In case this should be answered affirmatively, by what means the determination of such limit may be effected.

3. Whether, without undue interference with the freedom of action of shipowners and ship builders, and the consequent discouragement of improvement in the building of merchant ships, it be *possible* or advisable to acquire the registration of any other elements of construction which may be interesting and beneficial in a scientific point of view.

Now, if Mr. Atherton will only limit his agitation to the appointment of a committee, and that a competent committee, of gentlemen not nominated by one or two individuals, but fairly selected, either for their scientific or practical knowledge of the subject,—such a committee as must command the respect of the shipping interests—to consider and report upon the points stated above, he will have our cordial concurrence. If, however, he agitates for the unsettling of the fiscal arrangement for levying dues which now, after many years, at last seems settled upon a fair basis, he as assuredly will meet with our opposition.

We now come to Mr. Peake's rule, in our remarks upon which we must include all that we have to say in reply to both the gentlemen who have addressed us on this part of the question. It appears that the only *published* rule of Mr. Peake's is that of which we gave a brief outline to our readers in our last week's Number, and Mr. Atherton expresses his belief that it will be more highly appreciated by us when better understood than at present, and Mr. Peake himself says, that in our judgment of its value, we have been "grievously misinformed," for throughout the little work in which it is contained there is "no restriction to the curvilinear portions of the sectional areas being divided into triangles and curvilinear areas to any extent, leaving actually no deficiency in measurement; and to obtain the greatest distance between the two chords and the curve by trial, is evidently a matter of manipulation."

Now, as far as regards the *simplified* method of calculating the area of sections, as developed in the little work in Weale's Series, one definite method and one only, viz., that which we laid before our readers, was proposed. By this the area is divided into two triangles and *two* curvilinear portions, which are assumed to be parabolas. No *hint* whatever is given of the propriety or advisableness of dividing it into a larger number of triangles and curvilinear portions.

We think, therefore, that the great bulk of the readers of that little work, who are supposed to be beginners like ourselves, would rise from the study of it with the impression that it was essential to the simplicity of the rule that the area should be divided into two triangles and two curvilinear portions, and no more. As far, therefore, as any *published* rule of Mr. Peake's is concerned, we cannot allow that we have been grievously misinformed; and we cannot withdraw our remarks on the rule *as published* in the little book in question.

It seems, however, that since Mr. Atherton has been devoting his attention to the correction of the principles of ship registration, Mr. Peake has been applying himself to the simplification of the details of the actual measurement. He has sent us a little book, of 22 small pages, in which his efforts to attain this desirable end are developed. This little book, however, is not published, but only privately printed; and it would seem that Mr. Atherton's remarks really alluded to the extension of the former method, as set forth in this book.

Mr. Peake expressly informs us that his sole object in this little treatise is, to *simplify* the method of calculations, so as to bring it more within the acquirement of the novice than Sterling's rule.

How is this object supposed to be effected? By a series of independent calculations for each transverse section, which substitutes triangles for trapeziums, and a series of parabolic areas, all of which have to be calculated separately.

If the calculations on Mr. Peake's principle be correctly made, they ought to produce a result identically the same as that given by Sterling's rule, for the *principle* of calculation is identically the same.

We have already shown how any one, possessed of a very moderate amount of geometrical knowledge, may convince himself, with the greatest ease, of the close approximation which Sterling's rule gives him to the area of a curve. All the information he was supposed to bring with him for that purpose was the common expression for the area of a parallelogram and that for the area of a triangle.

Mr. Peake's requires his tyro to be further cognizant of the expression for the area of a portion of a parabola. To have an *intelligent* knowledge of this, the student *must* know something of the theory of limits, either geometrically or analytically. He *must*, therefore, be further advanced to understand Mr. Peake's than to understand Sterling's rule.

Every transverse section on Mr. Peake's method is divided into *one* parallelogram, several triangles, and several parabolic areas; each of which has to be calculated separately.

Take the example which he gives—the *Coquette*, and her midship section. His method, first of all, requires the curve to be laid down accurately to a scale. It is then divided into a parallelogram, three triangles, and three parabolic areas; to do which, eight lines have to be drawn, and three others estimated by aid of the compasses: and, of course, five independent calculations must be made.

To perform the same operation by Sterling's rule, five, or at most seven, breadths, must be measured at equal intervals; and the rule is applied at once by four operations, as has been shown.

Besides, for the purposes of tonnage admeasurement, there is an important difference of simplicity in the plans. By the authorised rule, the officer entrusted with the duty has only to enter *his measurements* in a book. By Peake's rule, besides the number of *independent* calculations to be made, he must first make a delineation to a scale of the length of the vessel, and then of the depth of the several transverse sections, and to each depth as a base line set off the line form of the section (the most accurate mode of doing which is by ordinates), and *after all this* he must draw his eight independent lines and estimate his three others.

How any one can seriously propose this as a more simple and more intelligible rule than Sterling's, and one better adapted to a novice, passes our comprehension! In point of correctness the rules are on a par.

We have no wish to depreciate either Mr. Peake's or Mr. Atherton's labours; but really when the object sought is simplicity, and so much parade is made of the wonderful improvement which Mr. Peake's mode is upon Sterling's in this respect, our risible faculties are excited, and we are forcibly reminded of Horace's well known line, *Parturiunt montes; nascitur ridiculus mus!*

CORT'S NATIONAL CLAIMS.

To the Editor of the Mechanics' Magazine.

Sir,—After the great interest which has been excited by this case, and the numerous communications respecting it which have appeared in your pages, it will be gratifying to learn that the claims of Cort's surviving family to a distinguished recompense, will be brought before parliament, with the strongest support, probably before the publication of this letter. Dark and painful as the details are which you have already printed, respecting the ruin of their father, they are absolutely colourless, compared to the further particulars since developed by close and unremitting research. Think of two clerks who entered the Navy Pay Office about 1781, at salaries of 50*l.* a year, being permitted by their superiors in office to execute a vulgar plot for robbing a partner, and carry it out by means of a *crown writ* obtained by *perjury*. It is now clearly ascertained that the extent in aid issued upon a false affidavit of one of these clerks, very rapidly promoted, *for his useful qualities of a certain kind*, to the office of Paymaster of the Navy, had no other result, and we must assume was intended to have no other result, than to put his ex-fellow clerk, Samuel Jellicoe, Cort's partner, into exclusive possession of the iron works at Fontley. Instead of being sold to discharge an *alleged default* of Samuel's father, to the Crown, the use made of writs *diem clausit extremum*, and other formidable specimens of law Latin, was to tie the freehold property in the safe *private keeping* of Cort's partner under a pretence of *public duty*. Henry Cort was expelled *in the name of the crown*, in 1789; Samuel Jellicoe remained in his *own name*, and in undisturbed possession carried on the "little mill at Fontley," for nearly thirty years. He retired in 1816, leased his works, and is since deceased, and this "little mill" is now *actually rolling iron*, in the tenancy of George Bartholomew, whose father, John Bartholomew, was Henry Cort's foreman, who instructed the ironmasters of Wales, Staffordshire, and Shropshire in the puddling and rolling of iron, and himself puddled the iron upon which Dr. Black operated in 1785. The disclosure of official infamy is truly hideous. The other clerk, Trotter, as his share of the spoil, took the patents and contracts, and what sum he or

his principal obtained for secreting and nullifying contracts which would have produced 20,000*l.* a year from 1789 to 1798, *had payment been demanded of the contracting ironmasters*, remains yet to be discovered—I hope to succeed. Mr. H. P. Delme, is now the owner of the "mill at Fontley," Bartholemew renting under him, and it will soon appear whence he derives his title to Cort's freehold. The misappropriation of the patent dues, and the proceedings of 1806, were therefore not the only questions upon which the committee of 1812 had to defend the government of that day from the dangers of a revival; but there were also crooked transactions, respecting *real estate* of a most singular character to be kept in the back ground, by an adroit rejection of Mr. Coningsby Cort's petition in that year. Cort's family deserve much for the wealth conferred upon the country, amounting directly to five times the cost of the late war, independent of incalculable collateral consequences, and for enduring benefactions to the whole human race; but if the words, "public morality" and "justice" be any thing more than names, they deserve even more as compensation for the crimes of officers of state perpetrated in the name of the state.

I am, Sir, yours, &c.,
David Mushet.

June 16, 1856.

P.S. In aggravation of everything extraordinary, I find, on examining the warrants to Cort's two daughters, that the *sign manual* of His Majesty George IV. renewing these pensions on his accession, gives them £25 6*s.* each. Yet, for forty years they have received £19 per annum, a deficiency of more than 25 per cent., making a total arrear (*without interest*) of £504!!! No Act of Parliament can be found to authorize this deduction. Deductions from pensions originally enacted to provide the interest for money borrowed by George I. and George II. were expressly confined to pensions exceeding £100 per annum, and all charitable pensions were excluded; but, what is much more, the 1st William IV. abolishes *all deductions* whatever from pensions on the Civil List, or payable out of any other funds. Yet, £19 only continues to come in to the daughters of a national benefactor, and no explanation can be discovered *why it is so.* D. M.

MECHANICAL LOCOMOTION.

To the Editor of the Mechanics' Magazine.

Sir,—If Mr. Rock had said at first that he only required one "support" and a separate point of impact, some trouble and space might have been saved; but I cannot admit that the term "support" can be correctly taken to mean otherwise than a sustaining point, which the point of impact which he now declares is all that is necessary besides one "support" would not be in any sense. But even with this modification, Mr. Rock's "fundamental condition" is still untenable, for Mr. Nichol's first argument (which I referred to in my last), of an engine slung under the axle of a pair of wheels, or a single broad one, is equally conclusive against it, there being but *one* point of support and impact there; so much is this the case that I think it best not to recur to this point again.

I am surprised that Mr. Rock should speak in terms of doubt of the possibility of my supposed engine resting on the rails being able to move; the case is the same as when a barge, resting on the water, is propelled by poles (or pistons) projecting from its sides sticking against the banks.

The explanation which Mr. Rock now gives of the cause of the motion of the engine when the crank is above the centre does not accord with that which he gave at first, but is, as I predicted would be the case, more in accordance with the view of the case which I have advocated. Applying himself to the real point of the matter, namely, where is the propulsive impulse communicated to the mass to be moved? he traces the reaction as pressing the engine backward through its pressure on the cylinder end, and being overcome by the pull through the piston rod; but as he still avoids reference to the *cause* of the piston's action being able to overcome, the reaction being the fact that it works *with a leverage* against it, arising from the traverse of the piston, he leaves his readers with an imperfect idea of how the operation goes on, and without having clearly shown why one of the equal pressures which he refers to is able to produce motion in opposition to the other. But this hypothesis is by no means the same, or in agreement with that proposed in his first letter, which was that as the wheel cannot revolve without slipping, without the engine being moved, it "is moved accordingly," or the old exposition of the matter, while now he actually traces the power to its application and point of pressure, as I anticipated would ultimately be the case.

* * * *

I am Sir, yours, &c.,
"C."

SPECIFICATIONS OF PATENTS RECENTLY FILED.

MAYALL, J. E. *Improvements in photography.* Patent dated October 24, 1855. (No. 2381.)

This invention relates to the application in photography of artificial ivory (consisting of gelatine and alumina) for receiving the photographic pictures. The tablets or slabs are composed of gelatine or glue in its natural state, and are immersed in a bath of alumina, which is held in solution by sulphuric or acetic acid.

CRICKMAY, C., and F. J. CLOWES. *Improvements in the manufacture of guns, pistols, and gun-stocks, and in cutting and carving wood, metals, and minerals, and other materials by machinery.* Patent dated October 24, 1855. (No. 2383.)

For manufacturing gun-stocks, the timber is first rapidly sawn to a form approximating to that required; the outline of the stock is then marked upon it by the aid of a flat pattern or template. It may then be cut to the exact length by means of two parallel circular saws, or it may be left a little longer than it is required to be when finished. The stock blanks are then taken to other machines by which the manufacture is completed.

RASCOL, E. H. *Improvements in apparatus used in the manufacture of type and other articles for letter-press printing.* (A communication.) Patent dated October 24, 1855. (No. 2385.)

This invention may be divided into three heads—1. The combination and arrangement of the parts which constitute the mould. 2. The matrix carriage which carries the matrix up to, and withdraws it from, the mould; and, 3. The means of finishing the type or other article cast in the machine. The mould is composed of four parts; the first is fixed on a plate on the table of the machine; the second is placed above the first; these two parts form the body of the type; the third and fourth parts, which form the thickness of the type, slide simultaneously up to, and recede from, the two former parts. This mould forms a kind of tube exactly of the length, thickness, and width of the type required to be cast. The matrix carriage slides in a tube, and is guided horizontally by springs, which are by means of a screw adjusted as required by the matrix for the thickness. Immediately the parts of the mould meet together the matrix approaches the type mould in a line at right angles to the face of the type; when in position the metal is pumped into the mould as ordinarily practised. The two parts forming the thickness withdraw simultaneously, and thus give a passage to the type, which is then pushed by an expulser between two pieces of sharp steel, which cut off any metal projecting on the type; subsequently two knives cut off the jet, and any parts that project on the body. The cast type is then finished and ready for use.

ARDOUIN, A. *A corking and capsuling-machine.* Patent dated October 25, 1855. (No. 2386.)

This invention consists in a circular table with sockets in which the bottles to be corked are placed, which table revolves horizontally with momentary stoppages to allow each bottle to receive a cork as it passes beneath a corking tube. The cork is forced by a piston into the bottle. The capsuling of bottles is effected as follows: At one extremity of the driving shaft are two mitre-cogged wheels which give a circular motion to a perpendicular shaft. This shaft can be depressed by a foot lever, and when depressed is driven into the upper halves of two or four clasps, thus contracting the lower ends of them around the capsule on the bottle, as each bottle is brought within the grasp of the clasps.

TRITTON, H. *An improved safety apparatus for the protection of persons while painting the exterior of buildings and cleaning windows, which may be used as a balcony for holding flowers.* Patent dated October 25, 1855. (No. 2387.)

This invention consists of a portable apparatus which may be readily affixed to a window, so constructed as to be perfectly safe for a person to stand upon, and so guarded as to render it impossible for any accident to occur by falling.

PLATT, J., and J. WHITEHEAD. *Improvements in machinery or apparatus for preparing clay for the manufacture of bricks.* Patent dated October 25, 1855. (No. 2389.)

Several arrangements for dividing "crude" or untempered clay into small particles, and for separating stones or other hard materials therefrom are described by the inventors.

ROBINSON, J. *Certain improvements in winding clocks.* Patent dated October 25, 1855. (No. 2390.)

This invention relates to ornamental clocks or time-pieces which are placed on stands and covered by glass shades, and consists in so arranging them that they may be wound up without removing the shades. The motion is communicated by means of wheel work to a horizontal axis which projects through the stand, and has a knob or handle fixed on it.

RICHARDS, J. A. *Improvements in producing the hard grain on leather.* Patent dated October 25, 1855. (No. 2391.)

This invention consists in producing the hard grain on leather by passing it, when in a state to receive the hard grain, under a

roller made thus: A skin of leather which has been hard grained is electrotyped, and the plate thus obtained is bent round and mounted on an axis.

SHARP, T. B., and R. FURNIVAL. *Certain improvements in machinery for drilling, grooving, and slotting.* Patent dated October 26, 1855. (No. 2392.)

This invention consists—1. In a compound drilling, grooving, and slotting machine, for making two slots or grooves by the combined action of rotary drills and lateral motion. 2. In giving lateral motion to the drilling headstock of such machines, and in allowing the article to remain stationary. 3. In applying to such machines, a chuck for giving a partial rotary motion to the article, whereby spiral grooves may be cut.

PINCHES, J. *Improvements in the construction of dies or stamps for marking papers, linen, or other substances.* Patent dated October 26, 1855. (No. 2393.)

This invention consists in placing the stamp or die in a case or holder, so constructed as to enable the marking to be effected by percussive force.

PUGH, E. *Safety alarum and signal apparatus.* Patent dated October 26, 1855. (No. 2395.)

This invention was described and illustrated in our number for May 10th (No. 1709), page 438.

KLEINSORGEN, J. C. F. BARON DE. *An improved variation and azimuth compass.* Patent dated October 27, 1855. (No. 2396.)

Claims—1. A method of ascertaining the variation of the magnetic needle by means of the south pole instead of the north pole, as hitherto adopted. 2. The employment of a suitable lens for concentrating the rays of light in the absence of direct sunshine when required to make an observation. 3. The employment of a metallic blade (by the shadow of which) in conjunction with the magnetic needle, to ascertain the variations of the latter.

STARK, E. *Improvements in pens for writing.* Patent dated October 27, 1855. (No. 2397.)

This invention consists in the construction of a pen and reserve holder, whereby a constant supply of ink is supplied to the pens as required. The occasional pressure of the finger upon a flexible diaphragm compresses the air inside, and causes the ink to flow down to the pen as required.

WYATT, H. *A peculiar apparatus for more rapidly and perfectly manœuvring or steering steam ships of war or of commerce, which is entitled "The Transpulsor."* Patent dated October 27, 1855. (No. 2398.)

Claim.—The moving of the screw propeller upon the principle of a rudder; and further, the application of a double axis joint for the purpose of rotating the same.

O'REGAN, S. *Improvements in marine engine boilers, and other boilers and their furnaces.* Patent dated October 27, 1855. (No. 2399.)

In one arrangement the inventor adopts tubes, placed either vertically or slightly inclined. At the back end of the furnace the heated air, &c., pass through the tubes when they are vertical, but around the outsides of them when they are inclined, and also around such vertical tubes as are placed in the flues; or alternate narrow flues and water spaces are formed with plain or galvanised corrugated boiler plates in the main flues and shell. Behind the fire-bridge is an air chamber, having a perforated or slotted metal plate. A regulating valve is attached. The furnace bars have a chilled surface, and are made moveable by a joggle shaft. The dead plate is usually in one solid piece, with slots or perforations at right angles to the furnace fire bars. Between the furnace door frame and dead plate is placed a bar, with thickness pieces to admit air. The furnace likewise admits a regulated quantity of air.

STIRLING, J. D. M. *Improvements in the manufacture of cast steel tubes and cylinders, applicable especially in the manufacture of cannon, mortars, and other guns, also steam and other cylinders.* Patent dated October 27, 1855. (No. 2400.)

This invention consists in casting steel tubes and cylinders in highly heated moulds, and in afterwards heating the moulds with the castings therein. They are retained at a red heat for some time, and are then cooled gradually. The tubes or cylinders thus cast and annealed may then be extended by hammering, drawing, or rolling, as in a former patent dated 27th February, 1854.

WOOD, P. C. *Improved machinery for preparing or scutching flax, and other analogous fibrous substances.* (A communication.) Patent dated October 27, 1855. (No. 2403.)

The patentee describes two machines. In the first (the breaking or bruising machine) the rough, uncleaned flax, after its roots have been well rasped, is fed forward on two endless travelling cloths. One of these is placed in front of, and even with, a pair of feeding rollers, which conduct the flax between a pressing cylinder and a roller beneath the latter; from thence the flax passes through a longitudinal opening made in a stationary plate, the surface of which may be grooved or roughened. A similar plate, also with a longitudinal opening, is attached to the upper end of vertical bars, to which an up and down movement is communicated, by means of an eccentric or crank below. Immediately behind this

plate is another pair of rollers, which receive the flax after it has passed through the two plates before mentioned. A second supply of rough flax is fed into the machine, by the second endless cloth, which is placed in such manner that the flax is passed over the pressing cylinder, but is made to enter the working machine at the same point as the first supply. By this means the two supplies of flax are united at the point where they pass through the plates, and an even and regular supply is maintained. It will be understood that, if the movable plate is set in motion when the flax is passing through it, the stalks of the plant will be moved up and down between the rubbing surfaces, and the boom, bark, or woody parts effectually broken and loosened, and may be easily detached from the useful fibres. The flax having been thus broken, is conducted into the second machine, where the woody parts are knocked out or removed.

HANDS, J. *Improvements in preserving animal and vegetable substances for food.* Patent dated October 27, 1855. (No. 2404.)

This invention consists in subjecting the matters to be preserved to the action of binoxide of nitrogen, nitrous acid, and sulphurous acid, each in a gaseous state, and they may be used either separately or combined.

SPEED, J. J., jun. *Improvements in car and carriage springs.* Patent dated October 27, 1855. (No. 2406.)

This invention consists in corrugating plates of a dish-shaped form for car and carriage springs, so that, from their peculiar construction, the fibres of the metal can expand and contract without straining the plates.

RILEY, G. *An improved roller-mill for grinding malt.* Patent dated October 29, 1855. (No. 2408.)

Claim.—The construction and use of a plain smooth metal roller mill for grinding or crushing malt, consisting of one or more pairs, in which the face of one or more should have a speed greater than that of its fellow or opposite roller, for the purpose of obtaining a crushing and grinding action at the same time.

WHITWORTH, J. *Improvements in artillery and fire-arms.* Patent dated October 29, 1855. (No. 2410.)

These improvements consist in apparatus for breech loading, wherein a yielding or an elastic breech is employed, which is drawn back to admit the charge at the rear end of the barrel. Also in apparatus for breaking and controlling the force of the recoil, by an elastic breech, or by causing the recoil to produce a spiral motion.

VILLEROUX, G. J. P. M. *Certain improvements in the manufacture of soap.* Patent dated October 29, 1855. (No. 2413.)

For obtaining toilet or fancy soap, the patentee has one part of Marseilles soap, dissolved in water over a slow fire, stirring frequently till it is reduced to pulp, to which he then adds almond, or any other nearly similar soap; after a complete dissolution, he throws into the mixture a bony substance, calcined, pulverised, and rendered almost impalpable. He afterwards pours in water, and, stirring the whole, allows it ten minutes boiling. On cooling the stuff coagulates, and assumes the form of a thick jelly, which is stirred a little, and afterwards left still. Soon after a lightly-coloured liquor separates, which is acrid and salty. He decants this liquor, and puts again over the fire the stuff, which melts, and after stirring and mixing, assumes the form of a thick paste, that is cast in any suitable moulds. For house soap, it will suffice to add to any common soap, after its dissolution in the manner described, a variable quantity of the pulverised bony substance, and submit it to a few minutes' boiling over a slow fire.

HARTLEY, W. *Improvements in safety valves.* Patent dated October 29, 1855. (No. 2414.)

Claims.—1. The application to a safety valve of a certain projecting disc or flange. 2. Placing the valve within a cup-formed chamber, which will afford an increasing area for the escape of steam. 3. Loading safety valves by means of balanced or nearly balanced levers, the whole load or part thereof being neutralised by the sinking of the water below a determined level.

CHAPPUIS, P. E. *Improvements in reflectors for the diffusion of artificial light.* Patent dated October 30, 1855. (No. 2417.)

This invention consists in combining glass with metal coated or plated with silver, aluminium, platina, or with a white metal, or amalgam of metals, to which a brilliant surface can be imparted by polishing, the object being to prevent the oxidation of the plated or silvered surface.

NAYLOR, W. *Improvements in power hammers and riveting machines.* Patent dated October 30, 1855. (No. 2419.)

This invention consists—1. Of improvements in the general construction of power hammers and riveting machines. 2. Of an arrangement of valves applicable to hammers worked by ordinary steam cylinders, so that the steam can be either admitted above the piston or not, at will. In carrying out the first part of the invention, the working cylinder is supported by cast-iron brackets, and attached to the framing. The working valve is formed of two pipes, one

placed inside the other. The outside pipe is perforated with several small holes in the central portion, and is furnished near the top and bottom with openings corresponding alternately with the upper and lower parts of the cylinder. The valve chest is cylindrical, but is cast or bored rather larger in the centre, so as to admit the steam into the valve chest at this part, to circulate round the valve, and pass through the perforations into the space between the inner and outer casing, and then through the upper or lower part into the cylinder.

LIGNAC, J. J. B. S. M. DE. *An improved mode of preserving animal substances.* Patent dated October 30, 1855. (No. 2422.)

The raw meat is cut small, and subjected to a current of hot air until it has lost about fifty per cent. of its weight. It is then compressed in cylindrical tin boxes. The operation is concluded by filling with concentrated liquor any spaces left in the box. The cover is then to be soldered on, and the box and its contents are submitted to a cooking vessel (or digester) to a temperature sufficiently high to produce steam in the box.

WALENN, W. H. *Self-acting attachment to be applied to gates.* (A communication.) Patent dated October 31, 1855. (No. 2423.)

This invention consists in a mode of hanging and operating gates, whereby they will open and close as a vehicle passes along, the vehicle causing the gate to open before reaching it, and closing the gate after it has passed through it.

GRIFFITHS, R. *A compound and exact measurement tap, applicable to the measurement of every kind of liquor or liquid.* Patent dated October 31, 1855. (No. 2424.)

The patentee uses two or more plugs fitting into bored barrels, placed apart, one above or beyond the other. The space between these two plugs forms a chamber for measuring the quantity, as well as serving to check leakage from the barrel. Instead of the ordinary plug, in certain cases flat sliding pieces are applied for closing the apertures. He connects together the handles of the several plugs or valves, and works them by a connecting rod, or by parallel sliding bars, which open either one, two, or more of the taps or valves, and permit a corresponding quantity of liquor being drawn off with precision, superseding the necessity for measures.

LAWRIE, J. G. *Improvements in shipbuilding, to facilitate the use of water as ballast.* Patent dated October 31, 1855. (No. 2425.)

A ship is built with water chambers fore and aft the ship, in some cases with two water ballast chambers, one on either side of the ship's hold, the space between being made suitable for receiving cargo; and in order that the water ballast chambers may also be suitable for carrying cargo, vertical water-tight doors are formed in the sides or ends.

RAMMELL, T. W. *Improvements in preparing black lead, chalk, and other materials used for drawing, writing, and marking.* Patent dated October 31, 1855. (No. 2426.)

This invention consists in coating black lead, chalk, &c., with cement, in order to give strength thereto, and to increase the diameter thereof.

DRAYSON, H. E. *An improvement in the manufacture of gunpowder.* Patent dated October 31, 1855. (No. 2427.)

This invention consists in dissolving the saltpetre, and combining the solution with the charcoal and sulphur, and then grinding the mixed ingredients under the mill, in place of grinding undissolved saltpetre with the other ingredients.

SWINBURNE, T. J. *Improvements in furnaces or apparatus used in the manufacture of glass.* Patent dated October 31, 1855. (No. 2429.)

Claims.—The constructing of furnaces or kilns for annealing glass with flues or tunnels under their floors, and in the side walls, for the purpose of admitting the passage of air through them, and causing the furnaces or kilns and their contents to be more rapidly and uniformly cooled.

GRIMWADE, T. S. *Improvements in treating milk in order to preserve it.* Patent dated October 31, 1855. (No. 2430.)

This invention consists in preserving milk by combining it with sugar and an alkali, and depriving it of its aqueous particles by evaporation, carried on at a temperature not exceeding 160° Fahr., so that it may be reduced to a powder. Also in constructing an evaporating pan made with a hot water case for the purpose of heating it, and with apparatus for causing the pan to oscillate during the early stages of the process.

FORLONG, R. P. *An improved manufacture of manure.* Patent dated October 31, 1855. (No. 2431.)

The object of this invention is to manufacture a manure which shall protect the end shoot or young plant from vermin. The patentee takes bone dust and pulverised sulphur, and mixes them together in equal parts by weight. This mixture he subjects to a furnace heat, just sufficient to fuse the sulphur and cause a thorough combination of the materials. After the compound has cooled, he grinds it to powder between a pair of French stones.

NEWTON, A. V. *Improvements in the manufacture of gas.* (A communication.) Patent dated October 31, 1855. (No. 2432.)

This invention consists of improved arrangements for the production and carbonisation of hydrogen gas.

LAXTON, H. *Improvements in gearing for increasing or decreasing rotary speed.* (A communication.) Patent dated November 1, 1855. (No. 2485.)

The inventor employs internal spur or bevel wheels, and places two of them in the same axial line, the other two gearing into them on a common axis within the circumferences of the first wheels, which is capable of revolving around the fixed axis of the first wheels. One of the wheels on the fixed axis is made stationary, and the other revolving, a crank being employed to transmit the motion to the fixed axis.

COX, R. R. *Improvements in the manufacture of artificial fuel.* Patent dated November 1, 1855. (No. 2486.)

The patentee combines together coal dust, spent tan, and cow dung, in equal parts, and adds from one to four per cent. of gas tar. The mixture is then made into blocks and dried.

MILNER, G. *Certain improvements in the manufacture of bedstead bottoms, part of which improvements are applicable to various other purposes for commercial and domestic use.* Patent dated November 1, 1855. (No. 2437.)

This invention consists in the application to bedsteads, &c., of elastic bands, interlaced like trellis or lattice-work, separately or connected with links of India-rubber.

TAYLOR, W. *An improvement or improvements in the manufacture of iron.* Patent dated November 1, 1855. (No. 2439.)

This invention consists in treating iron at that stage of its manufacture in which cast-iron is converted into wrought-iron. The cast iron is introduced into the puddling furnace, and melted and puddled until it acquires a pasty consistence, and then discharged into a vessel of water. The iron is thus cooled in a shape of a spongy mass, the water at the same time preventing its oxidation by the air. The iron after being removed from the water is reduced to a powder, by being passed through rolls or otherwise, and the powder is separated into portions of different degrees of fineness by sifting. The several powders are then washed, and each portion is separately treated in a furnace, in which the iron is balled. The several powders produce iron of different qualities, the finest producing the best.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

JOHNSON, J. H. *Improvements in lamps.* (A communication). Application dated October 24, 1855. (No. 2379.)

These improvements relate to lamps wherein the oil is forced to the wick, and overflows faster than it is consumed, as in the moderator lamp. The burner is supported by a bracket, and has a short glass chimney, the upper end of which carries a metal chimney, in which there is a throttle valve for regulating the amount of draught. The chimney passes through the oil reservoir, and thus the oil is heated. The oil passes from the lower part of the reservoir to the burner by a peculiar syphon pipe, formed in three parts.

JOHNSON, J. H. *Improvements in the production of dies and matrices, partly applicable to the production of printing surfaces.* (A communication.) Application dated October 24, 1855. (No. 2380.)

For the production of a die or matrix for stamping purposes a thin plate, having the desired device formed upon it, either by the electrotype process, or by stamping, is placed at the bottom of a mould, and an alloy of metal is then poured in over it, so as to form one solid die or matrix. For the production of copper plate printing surfaces, the design is obtained from an engraved plate by the electrotype process, and the plate so produced is strengthened, as before described, by pouring a suitable alloy over the back of it.

BUTTERWORTH, E. *Improvements in machinery or apparatus for preparing, spinning, and doubling cotton, wool, and other fibrous materials.* Application dated October 24, 1854. (No. 2382.)

This invention relates to the bearings formed in the copping rails for the spindles, and consists in so constructing the collar or bush constituting the bearing, that it is capable of being adjusted to compensate for wear.

FONTAINEMOREAU, P. A. LECOMTE DE. *Improvements in churns.* (A communication.) Application dated October 24, 1855. (No. 2384.)

The patentee describes a churn composed of concentric cylinders, between which the milk is churned, and the inner one of which is supplied with hot or cold water to regulate the temperature of the milk.

JOHNSON, E. D. *Improved apparatus for tuning stringed instruments.* Application dated October 25, 1855. (No. 2388.)

The object of this invention is to obtain a purchase for a box crab, or other mechanical arrangement, used for multiplying the axial movement of the tuning key, and transmitting the same to the string pins of pianofortes. This is attained by the use of an elastic-pointed lever, one end of which is attached firmly to the crab, and the other to a clamp, temporarily attached to the instrument.

CALVERT, F. C. *Improvements in the treatment of copper slags, scoriæ, or cinders, so as to obtain the iron which they contain.* Application dated October 26, 1855. (No. 2394.)

1. The inventor takes the raw slags from the furnace, either melted or solid, and introduces them into a furnace, and when in a state of fusion introduces into them from one-half to one-third their weight of quick lime, or from one-half to two-thirds of slacked lime, carbonate of lime, lime-stone, or magnesian lime-stone; and, after the mixture has been stirred, the mass is removed and allowed to cool. 2. He takes copper slags, or cinders, and roasts them in the open air, or in a kiln, and introduces them into a furnace and melts them with about one-third their weight of quick lime, or one-half of their weight of slacked lime, &c., as above; or he melts such slags, and then introduces into them the above compounds of lime and magnesia. When the mass is well melted he removes it, and allows it to cool. 3. He mixes raw, calcined, or roasted copper slags, with one-third to one-half their weight of quick lime, &c., and introduces them into a crucible, which he then places in a heated furnace, and when the mixture is well melted he removes it out of the crucible, and allows it to cool. After having prepared the above mixture of lime and copper slags, &c., he introduces such prepared slags, &c., into a cupola blast furnace, and proceeds to extract the iron they contain by melting them in contact with coke or coal, or a mixture of both.

ASHTON, J. *Improvements in certain parts of machinery known as "self-actors" (employed for spinning and doubling cotton and other fibrous materials), for more effectually crossing the yarns during the shaping or building of the "cops" than heretofore.* Application dated October 27, 1855. (No. 2401.)

This invention consists—1. In giving to the faller three movements during the running in of the carriage, by forming the upper edge of the copping rail with three inclined planes; thus, as the carriage runs in, the faller is raised by the first incline, lowered by the second, and again raised by the third. 2. In giving to the quadrant and spindles a varying speed, corresponding to the varying movements of the faller, by the use of a scroll constructed with a varying radius.

GEYELIN, G. *An improved construction of perambulator.* Application dated October 27, 1855. (No. 2402.)

This invention relates to perambulators that will admit of being brought into use in the nursery when not required for out-of-door service. This is attained by mounting the body of the carriage on a pair of rockers, and fitting wheels thereto, by means of clamps.

TOMLINSON, E., and A. M. J. *Improvements in waterproofing skins of animals.* Application dated October 27, 1855. (No. 2405.)

These improvements relate to means for preparing skins of animals to receive a coating of India-rubber, in combination with means of applying the coating. The inventors subject tanned skins to heat in a close chamber to draw the greasy or oily matters contained in them to the surface, and then apply absorbents for absorbing such matters. They then apply to the surfaces India-rubber in a plastic state, either alone or combined with other materials, by passing them between heated rollers.

ABEL, A. *Improvements in stopping, filling, or plugging teeth, and in instruments to be used therefor.* Application dated October 27, 1855. (No. 2407.)

This invention consists in the use of a metallic plug or cap, made concave on the underside, so as to cover and protect the nerve in a carious tooth; and in the use of concave or hollow drills, by means of which teeth may be drilled or scraped without touching the nerve.

TEMPERTON, T. A. *Certain improvements in shells and rockets, and other projectiles of a like nature.* Application dated October 29, 1855. (No. 2409.)

The inventor places a detonating cap in a tube screwed into the projectile, and within this tube is a piston, one end of which projects beyond the projectile, and the other end is held a certain distance from the cap by a spring; when the projectile strikes an object, the piston overcomes the spring, and comes against the cap, which then explodes.

KENNARD, J. *An improvement in the manufacture of children's and invalids' carriages.* Application dated October 29, 1855. (No. 2411.)

This invention consists in making the bodies of such carriages of sheet metal, stamped or pressed into dies.

ROUDIERE, L. *An improvements in boots for cavalry.* Application dated October 29, 1855. (No. 2412.)

The inventor sews inside of the leg of the boot, and nearly at two-thirds of its height, a counter-top or knee-piece, which is laid on the horseman's knee. On falling on the said knee-piece the rain glides over it, and drops down into the leg, but is stopped by the seam, whence the water is let out through metal eyelets.

JOHNSON, J. H. *Improvements in regulating the transmission of motive power.* (A communication.) Application dated October 29, 1855. (No. 2415.)

This invention consists of a weighted

lever, the weight of which is capable of adjustment, according to the amount of power to be transmitted.

FONTAINEMOREAU, P. A. LECOMTE DE. *Improvements in breaks for railway carriages.* (A communication.) Application dated October 29, 1855. (No. 2416.)

To each wheel of the carriage is applied one or more of the ordinary brakes. A wheel on a vertical axis is fixed to a bearing on the carriage, so that it may be thrown in or out of gear by the motion of a horizontal shaft fixed to the frame of the carriage. This shaft, by means of a lever, puts in action all the brakes.

HOLMES, W. C. *Improvements in steam boilers, and in the mode or method of preparing or generating steam, and in the apparatus connected therewith.* Application dated October 30, 1855. (No. 2418.)

The inventor proposes to place within each of the ordinary flue tubes of boilers a water tube communicating with the water of the boiler at each end, and placed at a slight angle to the horizontal line, to allow the water to circulate through them. The draft passes through the annular space between the two tubes.

BARRANS, J. *Improvements in steam-boiler furnaces.* Application dated October 30, 1855. (No. 2420.)

This invention consists of a combination of parts of furnaces where the products of one fire are caused to pass to and amongst those of a second. The fire-box is divided into two compartments, one above the other, either by a water space perforated with tubular spaces, or by hollow bars or water spaces with openings between them. Over the water spaces a second set of fire bars is arranged, on which a second fire is formed. At the back part of the upper fire is a perforated bridge of fire clay, and beyond such bridge are the tubular flues of the boiler. Air is admitted to the fire compartments, and also to the products passing from the lower to the upper fire.

HOCROFT, T., and R. FORREST. *Improvements in the manufacture of iron rods, bars, hoops, merchant, and guide iron.* Application dated October 30, 1855. (No. 2421.)

These improvements consist in piling together iron bars, and then rolling them down into one bar; this is slit into rods, and at the same heat passed through grooved rolls. By varying these grooves on the same rolls various descriptions of iron can be produced.

WOOLSTON, G. F. *Improvements in cutting and planing wood.* Application dated October 31, 1855. (No. 2428.)

This invention consists in the use of knives or cutters formed in, or placed on, the edge of circular or reciprocating saws, and bent at an angle, so as to plane off a thin shaving at each revolution or stroke of the saw, and protected by guard plates of metal.

LEETCH, J. *An improved method of constructing apparatus for the covering of the head.* Application dated November 1, 1855. (No. 2433.)

This invention consists in the construction of a band of tempered steel with elongated perforations, joined together by pins, and so arranged as to fit various sized heads; also, in the introduction of elastic materials so placed as to protect the head from a blow.

PROVISIONAL PROTECTIONS.

Dated March 6, 1856.

564. Thomas Tisdall, of Reynoldstown-house, Dublin, esquire. Improvements in machinery or apparatus for propelling steam vessels.

Dated May 8, 1856.

1085. Alexander Alliott, of the Park, Nottingham, engineer. Improvements in drying apparatus.

Dated May 10, 1856.

1106. Joshua Binns, of Dukinfield, Chester, spinner and manufacturer. Improvements in machinery or apparatus for winding, sizing, and beaming yarns.

Dated May 20, 1856.

1188. George Wilkinson, of Evans-street, Poplar, Middlesex. Improvements in steering apparatus, and in giving motion to machinery for raising and moving weights.

Dated May 22, 1856.

1221. William Churchill Dempsey, of Liverpool-street, King's-cross, Middlesex. A compound for removing all obstructions of the air passages.

Dated May 24, 1856.

1245. Adam Dunin Jundzill, civil engineer, Portugal-street, Lincoln's-inn-fields, Middlesex. An instrument for animating stereoscopic figures.

Dated May 26, 1856.

1251. Andre Adolphe Gaget, of Rue de l'Echiquier, Paris, gentleman. Improvements in bookbinding.

Dated May 27, 1856.

1268. Alfred Vincent Newton, of Chancery-lane, Middlesex. Improvements in reaping machines. A communication.

Dated May 28, 1856.

1270. Lemuel D. Owen, of Southampton-street, London, Middlesex, engineer. Improvements in the manufacture of artificial stone. A communication.

1271. John Macdonald, of Henry-street, Upper Kennington-lane, Vauxhall, Surrey, machinist. Improvements in the reflection, emission, and radiation of light and heat for lamps, lighthouse apparatus, and other useful purposes.

1272. Joseph Clark, of Buckskin-farm, Basingstoke, Hants. An improved horse hoe.

1273. William Fulton, of Glasgow, Lanark, N.B., wool spinner. Improvements in preparing and spinning fibrous materials, and in machinery or apparatus employed therein.

1274. Charles Herbert Holt, of Manchester, Lancaster, engineer. Improvements in steam-boilers, furnaces for the same, and apparatus connected therewith.

1275. George Bell and George Charles Grimes, fusee and match manufacturers, Vauxhall-walk, Lambeth. Improvements in the manufacture of frictional matches and fuzees.

1276. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. An improved coating or composition to be applied to substances in order to render them uninflammable, and in the method of and apparatus for manufacturing the same. A communication from Madame Boulard.

Dated May 30, 1856.

1278. Herman John van den Hout, of Covent-garden, Middlesex, artist. Improvements in the preparation of pulp for the manufacture of paper, millboard, and other like purposes.

1279. Alexander Drew, of Glasgow, Lanark, and Matthew Gray, of Bonhill, Dumbarton, N.B., calico printers. Improvements in weaving.

1280. Donald Bethune, of Cambridge-terrace, Hyde-park, Middlesex, esquire. Certain improvements in apparatus for dyeing.

1281. William Carr Hutton, of Sheffield, York, manufacturer. Improvements in stamps or hammers worked by power.

1282. John Weems, of Johnstone, Renfrew, N.B., and John Henderson M'Crindell, of Glasgow, Lanark, N.B., engineers. Improvements in the manufacture or working of metals and their ores.

1283. Frederick Luke Stott, mechanic, Thomas Belward, and James Findlow, joiners, of Manchester, Lancaster. Improvements in machinery or apparatus for washing wool or garments, and other articles made of textile fabrics.

1284. John Harris Heal, of Tottenham-court-road, Middlesex. An improvement in hair and wool mattresses.

Dated May 31, 1856.

1285. Adolphe Bouvallet, of Rue de l'Echiquier, Paris, manufacturer. Certain improvements in printing woven fabrics, velvet, skins, and other like materials.

1286. Francis Alton Calvert, of Manchester, engineer. Improvements in machinery for opening, cleaning, and carding cotton, and other fibrous materials.

1287. Alfred Watson and Alfred Hamlyn Williams, of Cornhill, London, stationers. An improvement in bottles, flasks, and other like receptacles for liquids.

1289. Fennell Allman, of Cambridge-terrace, Hyde-park, Middlesex, consulting engineer, and Donald Bethune, of the same place, esquire. Certain improvements in apparatus for separating fluids from solids, or for separating the more fluid particles from the more solid of various bodies.

1290. Henry Bessemer, of Queen-street-place, New Cannon-street, London. Improvements in shaping, pressing, and rolling malleable iron and steel.

1291. Robert Jobson, of Wordsley, Stafford, iron founder. Improvements in apparatus for making moulds for casting metals.

1292. Henry Bessemer, of Queen-street-place, New Cannon-street, London. Improvements in the manufacture of iron and steel.

1293. William Gossage, of Widnes, Lancaster, chemist. Improvements in the manufacture of certain kinds of soap.

1294. Daniel Spink, of Bridgwater, Somersetshire, engineer. Improvements in rails and railways.

1295. Francis Fowke, of Pall-mall, Middlesex, Captain, Royal Engineers. An improved portable photographic camera.

Dated June 2, 1856.

1296. Robert Blackwood, senior, of Kilmarnock, Ayr, N.B., worsted spinner. Improvements in machinery or apparatus for doubling yarns or threads.

1298. Thomas Wilson, of Birmingham, Warwick, engineer. An improvement or improvements in screw-wrenches.

1300. Stephen Rossin Parkhurst, New York, U. S. Improvements in paddle-wheels for steam-boats and vessels.

1301. Bennett Johns Heywood, of Leicester-square, Middlesex, gentleman. An improved construction of holder for leads and other marking materials.

1302. Louis Auguste Dieudonné, of Essex-street, Strand, Middlesex, gentleman. Improvements in nose-bags. A communication.

1303. Auguste Cadet, of College-street North, Camden-town, gentleman. Improved stamp-inking apparatus. A communication.

1304. Augustin Marie Herland, of Paris, France, gentleman. A new regulator pen-holder.

1305. Victor Jean Baptiste Mauban, of Rue de l'Echiquier, Paris, lamp manufacturer. Certain improvements in the manufacture of cans for holding oils and other liquids.

1306. James Edward M'Connell, of Wolverton, Buckingham, civil engineer. Improvements in locomotive engines.

1308. James Nasmyth, of Patricroft, Lancaster, engineer, and James Brown, of Newport, Monmouth, tin-plate manufacturer. Improvements in apparatus for the manufacture of tin plates.

1309. Joseph Groley, mechanic, of Paris, French empire. An improved plough.

1310. Edward Marsden, of Hanley-wood, Derby, agriculturist. Improvements in implements in pulverising and cleaning land.

1311. William Beadon, of Otterhead, Honiton, Devon. Improvements in agricultural implements for cleaning, cultivating, and rolling land.

Dated June 3, 1856.

1313. Thomas William Willett, of Chancery-lane, Middlesex, civil engineer. Improvements in the manufacture of gunpowder.

1314. George Josiah Mackelcan, of Islington, Middlesex, engineer. Improvements in the manufacture of rollers adapted to calico and other printing.

1315. Edwin Heywood, of Sutton-cross-hills, Leeds, designer, and Thomas Ogden Dixon, of Steeton, near Keighley, bobbin manufacturer, York. Improvements in the means of attaching drawer and other knobs or handles.

1316. Christian Rudolph Wessel, of Fitzroy-square, New-road, gentleman, and Francis Xavier Kukla, of Raven-row, Mile-end-road, doctor of philosophy, Middlesex. A vapourless glow-heat disseminator.

1317. Joseph Bauzemont, of Paris, France. Improvements in purifying turpentine.

1318. John Henry Johnson, of Lincoln's-inn-fields, Middlesex. Improvements in oil cans employed in lubricating machinery. A communication from J. F. Bérendorf, of Paris.

1319. Walter George Whitehead, of Birmingham, Warwick, manufacturer, and Frederick Augustus Harwood, of Birmingham, machinist. A new or improved candlestick.

1320. Jean Jacques Lebaillif, manufacturer, of Falaise, French empire. Improvements in beating, cleaning, napping, and dressing cotton, wool, flax, tow, and other similar fibrous substances, and stuffs or woollen cloths.

1321. Raymond Fletcher, of Derby, painter, and Edwin Fletcher, of Monk Bretton, York, paper

stainer. Improvements in sweeping chimneys or other flues.

1322. Montague Richard Leverson, solicitor, of St. Helen's-place, London. Improvements in tackle-blocks. A communication.

NOTICE OF APPLICATION FOR LEAVE TO ENTER DISCLAIMER.

A petition has been presented to the Solicitor-General for leave to enter a disclaimer to the specification of the following patent bearing date 6 January, 1855:—John Henry Johnson, of Lincoln's-inn-fields, Middlesex, bearing the title, "Improvements in machinery or apparatus for effecting agricultural operations, parts of the said improvements being applicable for the obtainment of motive power for general purposes." 9 June, 1856.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," June 17th, 1856.)

291. George Napier. Improvements in breaks for railway and other carriages.

300. Charles Henry Hudson. A retiring door or lid for boxes, cabinets, closets, rooms, carriages, and for all places or receptacles where or in which doors or lids are at present in use, or may be used.

318. George Napier and John Miller. Improvements in the mode of driving and in applying screw propellers to the propulsion of vessels.

321. John Fletcher and William Fletcher. Improvements in the construction of weighing cranes and other similar elevating machines.

328. Charles Frederick Phillipp Funcke. Improvements in tanning skins and hides.

353. William Henry Zahn and Joseph Henry George Wells. Improvements in windmills or wind-engines.

361. Frederick Steiner. Improvements in machinery to be used in drying fabrics.

362. Pierre Isidor David. Certain improvements in the method of bleaching.

363. John Mills. Certain improvements in the slide valves of steam engines.

364. Louis Vignat. A regulator compensator for the weaving of ribbons and cloths.

383. John Taylor. An improvement in constructing and facing walls.

396. Eddlestone Elliott, Cyrus Leach, and James Ratcliffe. Improvements in machinery for spinning wool and other fibrous substances.

402. George Harrison. Improvements in axles for railway carriages.

411. William Henry Walenn. Improvements in saw teeth. A communication.

438. John Barsham. Improvements in the manufacture of cases or packings for bottles and jars.

439. William Oliver Johnston and John Dixon. Improvements in cutting and working coal.

454. John Kingsford Field and Charles Humfrey. Improvements in the manufacture of paraffine candles.

456. James Griffiths. A new or improved brake for colliery and other steam engines.

472. Samuel Rodgers Samuels. Improvements in weaving fabrics.

479. Charles Iles. Improvements in pointing hair pins and in making up hair pins for sale.

482. Charles Damas Auguste Joseph Planque. Improvements in the manufacture of fecula.

495. George Parry. An improvement in the puddling and refining of iron.

568. John William Scott. An apparatus for fastening or securing buttons which may itself be used as a stud or button.

598. Edmund Alfred Pontifex. Improvements in the manufacture of tartaric and citric acids and tartrate of potash and soda.

857. Henry Laxton. A new and improved apparatus for increasing the buoyancy of ships and other vessels.

858. Richard Chrimes. Improvements in buffers and other springs for railway and other carriages.

962. William Smith. Improvements in constructing and applying windlasses for working ploughs and other agricultural implements.

1085. Alexander Alliott. Improvements in drying apparatus.

1111. John Ridal. Improvements in spring knife handles.

1211. Charles De Iongh. An improved method of separating and assorting combed fibres of different lengths.

1227. Charles Dewick, sen. Improvements in machines generally called rib frame or rib machine for producing fancy hosiery.

1243. Pierse Eustace Laurence Barron. An improved process for coating metals for sheathing ships and for other purposes, and in the means of attaching sheathing plates to ships or vessels. A communication.

1265. Ebenezer Talbott. Improvements in the construction of rails for railways.

1268. Alfred Vincent Newton. Improvements in reaping machines. A communication.

1270. Lemuel D. Owen. Improvements in the manufacture of artificial stone. A communication.

1272. Joseph Clark. An improved horse hoe.

1275. George Bell and George Charles Grimes. Improvements in the manufacture of frictional matches and fusees.

1288. William Needham and James Kite (secundus). Improvements in machinery or apparatus for expressing liquids or moisture from substances.

1293. William Gossage. Improvements in the manufacture of certain kinds of soap.

1315. Edwin Heywood and Thomas Ogden Dixon. Improvements in the means of attaching drawer and other knobs or handles.

1316. Christian Rudolph Wessol and Francis Xavier Kukla. A vapourless glow-heat disseminator.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

1853.

1424. Christopher Nickels.
1439. Joseph H. Penny and Thomas B. Rogers.
1442. Joseph Leon Talabot and John Davie Morries Stirling.
1453. James Dilkes and Edward Turner.
1456. John Elliott and John Brown.
1472. Joseph Warren.
1478. Robert Lister.
1493. James Worrall.
1530. Thomas Weatherburn Dodds.
1549. John Emanuel Lightfoot.
1726. William Thorp.

LIST OF SEALED PATENTS.

Sealed June 13, 1856.

1855.

2851. William Sangster.
2867. Frederick Robert Augustus Glover.
2900. Myles Kennedy and Thomas Eastwood.
606. Christopher Duckworth and Thomas Marsden.

Sealed, June 17, 1856.

2845. Charles Bracegirdle.
2850. George Gotts Golding.
2862. David Lloyd Price.
2866. Edward Davies and John Milne Syers, and Charles Humfrey.
2878. Andrew Shanks.
2916. John Barton.
2936. Thomas Fielden Uttley.

1856.

1. Henry Truelove.
16. George Williams.
40. Francis William Gerish.
99. Adolf Pollak.
100. Edward Hammond Bentall.
264. Thomas Burdett Turton and John Root.
512. John Fowler and David Greig.
584. James Mills.
592. John Fowler.
798. George Gwynne.
830. Arnold Morton.
840. William Edward Newton.
842. Arnold Morton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

CONTENTS OF THIS NUMBER.

Pumping Engines. A Description of the Pumping Engines of the Wolverhampton Waterworks, with Some Remarks on Water Pumping. By Mr. H. Marten 577
Mechanical Limbs. On the Means of Supplying some of the Uses of a Lost Hand, by Mechanical Arrangements. By Sir George Cayley, Bart. 581
Foreign Intelligence. By Dr. J. Lotsky:
Education by "Work" 582
Opening of European Commerce to Timbuctoo 582
Gigantic Rock Sculptures 582
Thorwalsden and King Louis of Bavaria 583
Bett's Patent Metal Capsules 583
Preventing the Escape of Acid Vapours 583
Tonnage Registration 583
Cort's National Claims 589
Mechanical Locomotion 590

Specifications of Patents recently Filed:

Mayall	Photography	591
Crickmay & Clowes	Gunstocks, &c.	591
Rascol	Type	591
Ardouin	Corking-machine	591
Tritton	Safety Balcony	591
Platt and Whitehead	Bricks	591
Robinson	Winding Clocks	591
Richards	Leather	591
Sharp & Furnival	Drilling, Grooving, and Slotting	592
Pinches	Dies or Stamps	592
Pugh	Railway-signals	592
Kleinsorgen	Azimuth Compasses	592
Stark	Pens	592
Wyatt	Steering Ships	592
O'Regan	Boilers and Furnaces	592
Stirling	Cast Steel Cylinders	592
Wood	Fibrous Substances	592
Hands	Preserving Food	593
Speed	Carriage-springs	593
Riley	Grinding Malt	593
Whitworth	Fire-arms	593
Villeroux	Soap	593
Hartley	Safety-valves	593
Chappuis	Light-reflectors	593
Naylor	Power-hammers	593
Lignac	Preserving Meat	594
Walenn	Gates	594
Griffiths	Measurement Tap	594
Lawrie	Water-ballast for Ships	594
Rammell	Black-lead, &c.	594
Drayson	Gunpowder	594
Swinburne	Glass	594
Grimwade	Treating Milk	594
Forlong	Manure	594
Newton	Gas	594
Laxton	Gearing	595
Cox	Artificial Fuel	595
Milner	Bedsteads	595
Taylor	Iron	595

Provisional Specifications not Proceeded with:

Johnson	Lamps	595
Johnson	Printing Surfaces	595
Butterworth	Fibrous Materials	595
Fontainemoreau	Churns	595
Johnson	Tuning Stringed Instruments	595
Calvert	Copper Slags, &c.	595
Ashton	Fibrous Materials	596
Geyelin	Perambulators	596
Tomlinson & Tomlinson	Waterproofing Skins	596
Abel	Stopping Teeth	596
Temperton	Shells and Rockets	596
Kennard	Children's Carriages	596
Roudiere	Boots for Cavalry	596
Johnson	Transmitting Power	596
Fontainemoreau	Railway Breaks	597
Holmes	Steam Boilers	597
Barrans	Furnaces	597
Hocroft & Forrest	Iron Rods, &c.	597
Woolston	Cutting Wood	597
Leetch	Hats and Caps	597

Provisional Protections 597
Notice of Application for Leave to Enter Disclaimer 599
Notices of Intention to Proceed 59
Patents on which the Third Year's Stamp-Duty has been Paid 599
List of Sealed Patents 600

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1716.] SATURDAY, JUNE 28, 1856. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

GOLDTHORN-HILL PUMPING ENGINES.

Fig. 13.

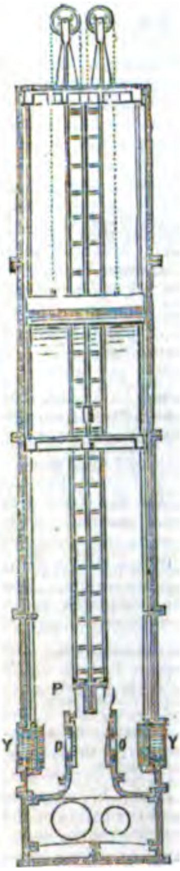


Fig. 14.

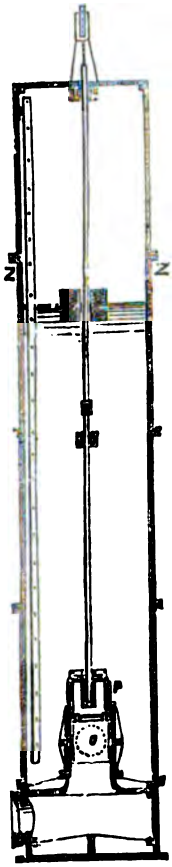


Fig. 17

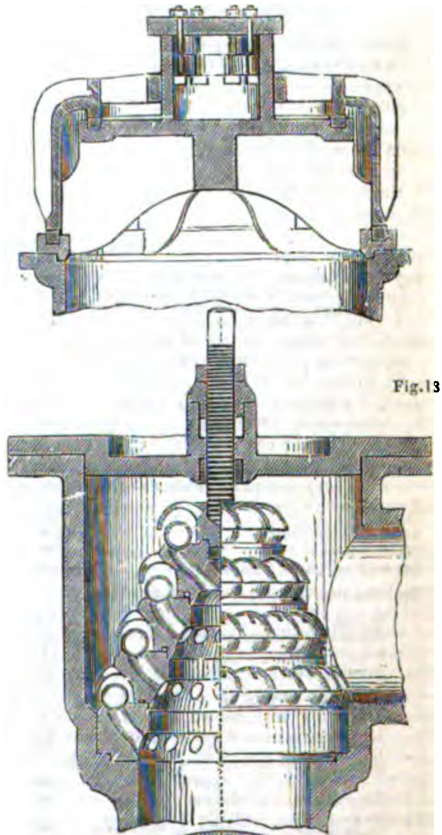


Fig. 19.

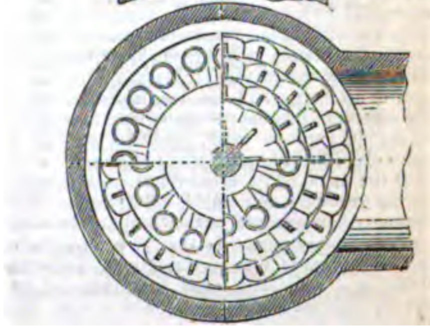
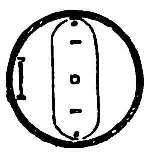


Fig. 15



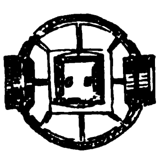


Fig. 16.

PUMPING ENGINES.

A DESCRIPTION OF THE PUMPING ENGINES OF THE WOLVERHAMPTON WATER WORKS, WITH SOME REMARKS ON WATER PUMPING.

BY MR. HENRY MARTEN, OF WOLVERHAMPTON.

(*Concluded from p. 580.*)

THE Tettenhall engines deliver the water over a stand pipe, 180 feet high, whence it flows by its own gravitation to the town. The Goldthorn Hill engine delivers through an air vessel into two covered reservoirs lying near the engine, and raised about 20 feet above the top lift, and holding together 1,500,000 gallons. The reservoirs are arched over, and covered with two feet of soil, for the purpose of preventing vegetation and variation in the temperature of the water when exposed to the atmosphere, and this end is answered well, the water remaining for months at the same temperature, and perfectly clear and free from all vegetable or animal impurities. The reservoirs are prevented from being overfilled by a self-acting check valve, shown in figs. 13 to 16, which shuts against any supply beyond a certain limit, so that the man working any pumping engine at a distance at once knows when his work is done. The valve is so arranged, that immediately the engine ceases to work, the supply to the town is maintained from the reservoir through the flap valves, O, underneath the self-acting stop valve P, which open immediately there is any requirement for the supply to the town.

The object of a stand pipe is that the water may be always delivered from the engine over one uniform height, and consequently of one uniform pressure on the engine, whatever varying circumstances may affect the delivery after the water has once passed the top of the stand pipe. Thus far it is useful, as the engine can always work under a defined pressure; but it is rather a costly and unsightly mode of attaining what in practice is found to be an unnecessary degree of perfection; since with a tithe of the cost all the necessary safety can be procured by pumping into an air vessel with a check valve on the delivery side; so that in case of a pipe bursting, or any sudden diminution of pressure taking place, it would be impossible for the engine to "go out of doors" at more than a certain regulated speed, by the partial contraction of the area of discharge through the self-acting movement of the check valve. Unless the stand pipes are carefully cased in winter, they are in great danger of being frozen, and very serious consequences have arisen from this cause. There is also a drawback with them, on account of the great weight of the column of water which has to be set in motion from a dead stand at each stroke of the engine.

The successful working of any pumping engine is dependent in a great degree upon the perfection of the pump valves. These must be so arranged as to deliver the water with ease and rapidity, and without any concussion in closing. As an illustration of the great practical importance of this question, it may be mentioned that when the Cornish pumping engine was first introduced for water works purposes on a large scale, it was on the point of being altogether abandoned on account of the imperfection of the pump valves. The valves were of very large area, and on the old butterfly principle, and consequently, under the heavy pressure at which they were working, the concussion caused in shutting was so violent as to occasion serious alarm for the safety of the machinery and foundations. For some time the problem to be solved—to find a method of constructing a valve which should present a maximum area of discharge, with a minimum area of surface exposed to the concussion of the recoiling load at the termination of each stroke of the pump—presented difficulties that appeared insurmountable, until the idea of the application of a modification of the double-beat steam valve for the purpose happily occurred to Messrs. Harvey and West. These gentlemen adopted the expedient of making the double-beat valve self-acting, by slightly contracting the upper beat, as shown in fig. 17, so as to allow the difference between the areas of the outside of the upper beat and the inside of the lower, as a surface upon which the pressure might act for opening and shutting the valve. This plan answered admirably; the valve in opening a very slight distance gave a large area of discharge, and the area upon which the recoiling column descended, being only the difference between the upper and lower areas, and not the entire area of discharge as in the old butterfly valve, formed a surface insufficient to cause any concussion. This valve also afforded under all circumstances a means of regulating the pressure tending to shut the valve, whatever might be the height of the column of water or the total pressure of the recoiling column, by adjusting the difference of area of the upper and lower beats inversely in proportion to the height of the column.

For ordinary purposes, that is to say, for small lift pumps and colliery engines, the butterfly valve is very serviceable, as there are no expensive faces to be ground up, or liable to derangement from impurities or grit in the water, and they are easily and readily repaired on the spot. For a class of work one grade higher than ordinary, the writer has found no description of valve answers better than the double-beat ring

valve, similar to those employed in the engines at Tettenhall and Goldthorn Hill, and shown in fig. 9. Large valves of this construction, of 16 ins. to 20 ins. diameter, answer well made of cast-iron with wooden beats. Smaller valves, of 8 ins. to 15 ins. diameter, are better of gun metal working face to face. Of the latter description the writer has had some at work for more than two years, under a pressure of 260 feet head, without any perceptible wear having occurred.

At the Hull water works a new description of valve has been adopted in one of the pumps for some time, and is found to answer remarkably well. The valve is shown in figs. 18 and 19, and consists of a pyramid of circular seats, one above another, in each of which there are a number of small circular beats, about 2 ins. diameter, into which a corresponding number of gutta percha balls drop. The action of this valve, as will be seen from the figure, is very simple. It was invented by Mr. William Hosking, and inserted in the place of a double-beat valve. It is 22 ins. diameter, and works under a head of 160 feet, in connection with a plunger pump with a direct-action steam cylinder. Immediately upon starting it was found that this valve lightened the burden of the engine about 1½ cwt., and it has since been working with great satisfaction for a considerable period.

The advantages of this valve are more than are apparent at the first glance. In the first place, it is much safer than any other form of valve, as will be seen at once, supposing a piece of wood or other material should pass through the pump, as is not unfrequently the case. With the ordinary valve, if it should be caught on the beat, it would hold the whole valve open, and let the engine "come out" with a run, and possibly cause considerable damage; but with the small balls, a piece of wood so caught could prop open only one out of fifty-six balls, which is so small a per centage of the whole opening that it would merely enable the man in charge of the engine to perceive that there was a little amiss by an increase of leakage, but could cause no damage.

In the second place, the balls being nearly of the same specific gravity as the water, are just floated open the moment the current turns in their favour; whereas in all other valves, in addition to the column of water to be lifted, there is also the weight of the heavy metal valve to be opened and held suspended during each stroke. This was practically exemplified in the Hull case mentioned above, where a considerable load was at once removed from the engine on the application of the new valve. With larger valves this point becomes one of still greater importance, as they often weigh 5 cwt. or 6 cwt. each.

In the next place, whilst the area of discharge may be made fully equal to that of the plunger, the area exposed to concussive action in the closing of the valve is reduced to the smallest possible limits, being practically reduced to the impinging force upon one ball, the last one that shuts, that is, 1-56th only of the total area of beating face. This is owing to the circumstance that the balls do not all rise to the same height above their seats; and consequently, as the force of the current acts upon each individually, on the cessation of motion they shut in accordance with the height they have to fall, and a communication exists between the water on the upper and under side of the valve, until the absolute closing of the last ball. The result is, that although the difference in time between the falling of the various balls must be exceedingly minute, it is such as practically to prevent all concussion.

Lastly, the valves constructed on this plan are very readily repaired. It is only necessary to keep a few spare balls ready to be inserted in the place of any that may be occasionally damaged; and the old ones, on being warmed and recast in a mould kept for that purpose, are again as good as new.

Where it is proposed to work with a high pressure of steam, cut off so as to allow of a considerable expansion, the writer's experience has led him to prefer the beam to the direct-action engine. He has observed that as a rule direct-action engines working under a high initial pressure are apt to start off at a speed which jars and strains the whole of the machinery throughout. The speed obtained by the piston as driven indoors at the beginning of the stroke is many times greater than the average velocity per minute; and consequently, unless all the parts are made extra strong in proportion, the bearings wear out with great rapidity, and the machinery is soon loose at every joint. In a beam engine, on the other hand, a very large proportion of the initial force is absorbed in overcoming the inertia of the heavy beam, which thus becomes a reservoir of surplus force in the earlier portion of the stroke to be given out during the later, and the result is that a comparatively steady velocity is maintained throughout the stroke, much to the advantage of the whole of the machinery; indeed it is only with this adjunct that expansion can be carried safely to a very high degree. The beam in fact is a reciprocating fly-wheel, and is attended with precisely the same action and the same beneficial results. The writer is acquainted with a case of two large expansive engines of nearly the same size, working near together, of which one has an open net-work beam of about thirty tons, and the other a heavy strong

beam of forty-five tons weight. The difference in the working of the two engines is very perceptible, and nearly 5,000,000 lbs. duty in favour of the heavy beam, in the steadiness and smoothness of the motion. In many cases where a jar is perceived in pumping engines working with a high expansion, it may be cured by increasing the weight or inertia of the beam.

For pumping a large quantity of water through an unusually great length of main pipe under a heavy pressure, the writer's experience has led him to prefer a description of engine consisting of a pair of high pressure expansive double-acting beam engines coupled together at right angles to one large fly wheel. The pumps should be of the combined plunger and bucket description, with Hosking's valves. There should be an air vessel and back flap valve to each pump, with a blow-off valve loaded to a certain weight, so that in the case of any recoil in so great a length of main, the pumps would not be burst. Along the main pipe, at each 50 feet of elevation above the pumps, the insertion of a back-flap valve is required, so that in case of any pipe bursting the whole main should not be run dry. The leading point to be kept always in view in the design and construction of engines under these circumstances is the maintenance of a constantly uniform flow of water through the main pipe from the pumps. This is provided for by the compound double-acting pumps and the large air-vessel accommodation, together with the coupling of the engines at right angles. The boilers should be similar to those of the Goldthorn Hill engine.

Many engineers prefer a double cylinder engine for conducting expansive operations; but although in some circumstances this may be advantageous, as for driving machinery where uniformity of power throughout the stroke is a desideratum, yet for large pumping engines the writer prefers single cylinder double-action engines. The arrangements with a double cylinder are much more complicated, and he finds that all useful degrees of expansion can be carried out sufficiently with a single cylinder.

A very cheap and effective description of temporary pumping engine for rough colliery purposes, where saving in first cost is a more important object than great economy of fuel, came some time since under the writer's observation at a colliery near Nailsea. The engine was constructed by Hughes, of the Uskside Foundry, Newport, and consists simply of a large open topped cylinder placed vertically on two cross beams over the pit shaft. The working apparatus consists merely of a steam valve for admitting the steam under the piston, and an eduction valve for letting it out, with a steam slide throttle valve, and eduction slide throttle valve, for regulating the rate for the admission and exit of the steam. The two former valves are worked by tappets attached direct to the piston rod: the two latter are adjusted by hand, so as to regulate the number of strokes per minute, the engine being in fact its own cataract. This engine is remarkable for its simplicity and cheapness of construction, and has now been at work for some years. The consumption of fuel with a good description of boiler is not more than the average of ordinary colliery pumping engines as at present constructed. The general arrangement for a plunger pump would be as described above; with a lift pump it would be necessary to have a balance bob. Its security is also very considerable, since if the two throttle valves are properly adjusted, no great damage could occur should one of the other valves stick, as the piston could not travel either up or down faster than the steam could pass through the guarding throttle valve. It is also a portable description of engine, which is sometimes a recommendation in proving mines.

For raising water from mines in a district such as this, where fuel is abundant, a reduction in first cost is a much more important question than in districts where the fuel has to be imported at great cost; that is, setting the first outlay and interest for erecting a large expansive engine with low consumption of fuel against the smaller outlay with larger expenditure of fuel, it will generally be found that, in districts such as this, the latter is the better within certain limits for the party investing capital in opening mines. Everybody concerned in opening works of this description must be aware how important it is to economize first outlay, whereas, when returns commence, a small extra annual cost is not felt. Under these circumstances, in a district such as this, the writer would not recommend the erection of expensive Cornish engines for drainage purposes. Their first cost in every respect is very great; a cylinder and all machinery to match to do 1000 horse power work is put down to perform really only 200 or 250 horse power, and all the parts of the ponderous machine have to be constructed of sufficient strength to resist the heaviest initial blow of the steam.

The plan of plunger lifts, carried out so extensively under this system, is not only expensive, but highly inconvenient in narrow pits. Whereas, much the better and cheaper plan is a simple lift pump, with the beam balanced, so that the weight of the pump rods shall just carry the engine "out of doors." Plungers are in their place for forcing water above

the level of the engine, as in the case of water works, but in the engine pit of a mine, with a strong and heavy rod having numerous guides and rollers, they are very inconvenient, and if the engine is properly balanced they effect no saving, as the piston must not travel faster than the rate at which it is safe to work the bottom set of rods, which must necessarily be attached to a lift pump.

In concluding these few observations on pumping engines, especially in reference to this district, the writer cannot but observe with regret, that although pumping machinery is now carried to such perfection, there has been for so many years such a large amount of the mineral wealth of South Staffordshire lying inaccessible, from the want of some comprehensive and efficient system of co-operation for draining the mines. In former times, before the invention of the steam engine, when the mechanical difficulties appeared insuperable for winning the deep mines, there was evidently a considerable amount of co-operation in the endeavours of the "old men" to relieve the water from the upper levels by means of adits and tunnels. At the present day, when mechanical difficulties have been so completely overcome, and the means for obtaining unlimited pumping power are at hand, these co-operative relationships, with some few exceptions, appear altogether abandoned. It ought not to be more impracticable for some of the most experienced mine agents to parcel out the South Staffordshire coal district into satisfactory drainage areas, than it is for the Fen Bailiffs of Lincolnshire to arrange their respective districts, and satisfactorily apportion the charges to be made on the various estates. Although a good deal of floating attention has been paid to this subject at various times, yet hitherto no thoroughly digested and comprehensive plan has been devised. There is no doubt, however, that the urgency of the case is daily becoming greater, and it will afford the writer great satisfaction should these few observations in any way conduce to some practical effort being made towards the accomplishment of so important an object.

THE INUNDATIONS IN FRANCE.

PRELIMINARY SUGGESTIONS RELATIVE TO THE LATE DESTRUCTIVE FLOODS IN FRANCE, WITH A VIEW TO INSTITUTE SUCH LOCAL INQUIRIES AS MAY LEAD TO THE MOST EFFICIENT AND ECONOMICAL MEANS OF MITIGATING OR PREVENTING SUCH AWFUL CALAMITIES IN FUTURE.

BY SIR GEORGE CAYLEY, BART., ASSOCIATE OF THE ROYAL SOCIETY OF CIVIL ENGINEERS.

NOTHING probably can be more congenial with the feelings of the French nation, and its patriotic Emperor, than to find the best efforts of our talented engineers volunteered in aid of their own, on this great and difficult question; but without very searching local investigation, nothing specific can as yet be suggested by them. The question, however complicated in its ultimate details, amounts in principle to the effects of gravitation, simply, or combined with the influence of external pressure on water. The mimic whirlpool in the tea-cup, the mountain swell of the Atlantic wave, or the thundering plunge of Niagara, are all effects of the same causes acting under varied circumstances.

Having been chairman of the directors under the Muston Drainage Act (North Riding of Yorkshire) ever since its commencement, more than thirty years since, under which ten thousand acres of frequently flooded land have been effectually drained and profitably cultivated, it may prove useful to state the means used at, and the experience obtained from these works; more especially as the late William Chapman, Esq.,* civil engineer of Newcastle, appointed under the Act to carry out this drainage, informed the directors that the principles he made use of were not those commonly applied at that period in this country; but were adopted from *the French engineers*. The usual plan of English drainage was to bring all the waters of the rivers, brooks, and surface rain, into one channel; and carry them in as short a line as possible to their lowest outlet, and in as large a sectional deep cut drain as could be afforded, with reference to the improved rental of the district when so drained. In several of these drainages, the expenses so far exceeded the improvement, that many proprietors abandoned their land rather than pay their assessments.

The method used by Mr. Chapman differed essentially from the old practice. Instead of altering the river to make a channel large enough to convey the whole of the flood waters by deep cutting, he separated what may be termed the living waters of the rivers and brooks, which at all times furnished a considerable supply, from the surface water of the land that had to be drained.

This was effected by leaving the living waters to flow in their original beds; and in times of flood, to overflow the adjacent surface till confined within embankments at a

* Much esteemed for his large experience in the management of piers and harbours, both in England and Ireland.

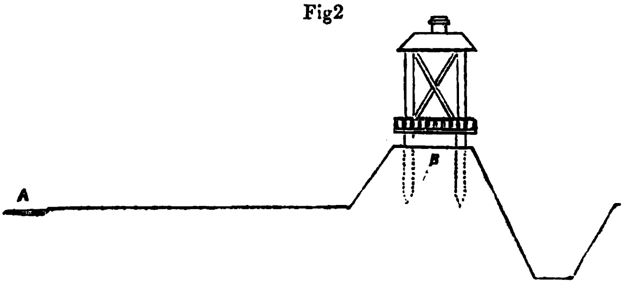
sufficient distance on each side to convey the largest known amount of the floods of the district. To form these embankments it is necessary to cut deep into the soil, and heap it up on the sides next the river or brook, by which a sufficiently deep drain is left on the outside for effectually drying all the land of the district, and bringing it into cultivation.

What has thus been effected on the scale of ten thousand acres, seems equally applicable to any larger scale of drainage. Some years ago this method was proposed to the late Pope, as applicable to the Pontine Marshes, and a large fund was at hand to carry it out; but improvement was not the order of the day at Rome, and the proposal was rejected.

These arrangements will be more clearly understood by inspecting the diagram, fig. 1, where A represents the ordinary flow of river water, carrying also the embanked

Fig. 1.

Fig2



rivulets, which together, in times of the highest floods, swells so as to fill the embankments, B B. C C represent the deep external drains for carrying off the surface water to the lowest outlet the general fall of the district permits.

These essential elements of drainage will have to be varied in position and dimensions to suit the cases to which they are applied. Thus the number of miles distant from those mountain ranges from which these floods are collected to the place of the deepest flood in the low district, and also the altitude of those ravines above that line, are what regulate the time, position, and degree of the highest flow of the water that has to be provided for.

If I may venture to make any suggestion as to the gigantic embankments which may be required in restraining the floods of the Loire and other French rivers, it would be to take advantage of their elevation for placing wooden cottages and farm buildings upon them, supported on piles, with a water way under them, in case of the floods reaching the top of the bank.

For economy, these banks must be of the smallest dimensions, to be secure in their vast length; but they can readily be enlarged when buildings are required. Fig. 2 gives a rough sketch of such an arrangement; A representing the distant river within its ordinary banks; B the embankment in its least width, with a cottage on piles.

To state the general principles of drainage is no difficult task; but to carry them out, under the gigantic and ever varying circumstances of the vast plains of France, will demand the most accurate surveys, and other local investigations, and will tax to the utmost the abilities of the highest class of engineers to apply them with beneficial effect. The *rapidity* with which the mountain districts pour forth their accumulating waters is one great element of the floods below; and if in the deep, uncultivated mountain ravines any obstruction, by firm dams, could be given, it might be a first step in the process.

In the experience derived from the Muston drainage, it appears that at intervals of about twenty years the floods derived from the hills ten miles distant have come down with from five to seven times the ordinary amount of water; and had these hills been further off, the accumulation would, of course, have been less in the same degree. In the Muston drainage, unfortunately, the distance of the embankment from the river was not ample enough, and the great floods, in some measure, got over them, committing damage to the crops in some places; but in this drainage the extra

value of £1 per acre was obtained at a cost of £4, when the same rent of land would have cost £30. It appears that the main problem, on the great scale, will be, so correctly to estimate the velocity of the flood, at each of its depths and long successions of falls, that the area of its section, multiplied by the velocity, may amount to the same sum; thus equal quantities of water will pass in the same time; hence, when the velocity is doubled, one-half the sectional area will be sufficient, and *vice versâ*.

GEO. CAYLEY.

39, Welbeck-street, June 20, 1856.

ON LARGE BELLS AND BELL MACHINERY.

(*Concluded from page 562.*)

Resumed Discussion at the Ordinary General Meeting of the Royal Institute of British Architects, Feb. 11th, 1856.

Mr. Ashpitel, Fellow. Bells should be considered first, as single bells—secondly, as forming part of a peal or chorus, or a double quartett when there were eight in a peal — and thirdly, as carillons or chimes. The old-fashioned form for a bell had never been surpassed, provided the waist had a sufficient sweep. The flower-pot shape, or anything approaching it, was bad, and produced what might be described a growling tone. The bell of St. Peter's, Rome, too nearly approached that form. Mr. Denison had stated, that in the present day with a view of saving metal, the lower bells were made too light and too deep in tone; but he (Mr. Ashpitel) would suggest whether, by calculating these matters too strictly, they might not be likely to get peals in which the upper bells would be too weak, and the lower bells too noisy. A peal of bells should be regulated on the same principle as the instruments in an orchestra. In the orchestra of the Philharmonic Society, there were eight double basses to thirty-two violins, and if there were as many of the former as the latter, the sound would be "all bottom." In the case of carillons or chimes the upper notes must predominate, just as the accompaniment is subdued at a concert to allow the air to be heard clearly. The Royal Exchange bells had this defect; the upper bells, which should give the air, could not be clearly heard. Messrs. Mears had stated to him (Mr. Ashpitel), that the Royal Exchange bells were made according to the traditions of the trade for centuries: but they stated when a subdued bass note was required to fill up the harmony, it was found that the same force of blow was given by the machinery upon the lower bells as upon the upper ones. As nearly as he had been able to follow Mr. Nichols' explanation of his formulæ, he thought that gentleman had forgotten the effect of the centrifugal force in ringing bells.

Mr. Nichols explained that he had duly allowed for the centrifugal force.

Mr. Ashpitel. The *pitch* of the sound of a bell, whether A, B, C, or D, &c., in the gamut, depended on the *number* of vibrations in a second. In Euler's time that of the lowest CC on the violoncello was 118; since he wrote, concert pitch has been raised, and the number of vibrations producing the C C are increased. The next question is the *quality* of sound, or whether a rough noise or a musical sound is produced; this depends on the *equality* of the vibrations in point of time; in other terms, whether the vibrations were isochronous, and this results from the solidity of the material. A bell containing a flaw, or a violin string a little frayed, will not give regular vibrations, nor a pleasant tone. Another condition was the *loudness* or *softness* of the tones, and this depended on the *intensity* of the vibration, the harder the bell was struck, or the further a string was pulled back. The note in point of pitch would be the same, A, B, or C, and the *force* of the vibrations would cause the forte and piano.

Mr. G. Foggo, Visitor, referred to Réaumur's experiment, showing that sound can be produced by a hemispherical mass of lead cast in a ladle.

Mr. Ferrey, V.P., gave some explanation of his remarks on the injury sustained by towers from bell ringing. Many towers, no doubt, had been so badly built that the effect from that cause had become very serious. The tower of St. Mary's, Taunton, for example, had a mere rubble wall with thin ahslar, and the building had consequently suffered materially, and was now in danger. But in other buildings the same defects had arisen from the negligence of those who had charge of the bells. If, however, the bell-framing was properly adjusted, if the bells had free and proper action, and were properly placed together, no injury whatever would accrue to a well-constructed building. In the case of Bellbroughton church, two bells were added to a peal a few years ago; the framing for these was placed upon the original one; and timbers were introduced strutting across from side to side of the base of the spire; the oscillation of the bells very soon caused an abrasion of the ends of the timbers, which became in fact so many battering rams acting upon the masonry; and they so shook the whole fabric, that it was necessary to take down and rebuild the upper part of the spire. Some churches in Surrey contained inte-

resting bell-cages, built from the floor of the church upon stone cushions, and not connected with the masonry.

Mr. Denison, Q.C., Visitor, observed that the leaden hemisphere referred to by Mr. Foggo was perfectly familiar to him. He had not the smallest objection, as he had before stated, to any person adopting Mr. Baker's method of hanging bells. Mr. Baker or his friends had asserted that he (Mr. Denison) had adopted Mr. Baker's principle; and to prove it they quoted three lines of that gentleman's specification, viz.:—"My invention consists in hanging such bell upon one bolt or axis." The drawings before the meeting would show that he had not adopted that method. Therefore, if the question of piracy should arise, he advised Mr. Baker to save his money and keep clear of litigation. Mr. Denison then referred to the "setting up in the stock," and to the ringing of the bells at York and Erfurt, as mentioned at the last meeting. Mr. Baker, by a certain amount of calculation, endeavoured to prove that it was easier to raise a bell when it was set up in a stock; but the question was, whether by doing so certain conditions of friction were not introduced, which would interfere with the raising, and more than counterbalance what was gained in the way of counterpoise. He never knew any case of friction that could be determined otherwise than by experiment. Mr. Airey, the Astronomer Royal, had calculated the friction in the wheels of some clock-work, but the result proved that he was deceived, as he (Mr. Denison) had predicted. Now he did not take any credit to himself for being able to calculate the friction better than Mr. Airey, but in all these matters there was a sort of instinct, or rule of thumb, the result of experience, which was better than any amount of calculation. Mr. Baker gave instances of bells in London which were improved by being re-hung and set up in the stock; but the result might have been due to something else. Mr. Baker had not correctly represented what he had said about "sliders." He had in fact stated that they might be bits of stick. When he began bell ringing, he broke a great many stays, and came to the conclusion that, by breaking sliders instead of stays, he should save money, and therefore, his sliders were made of sticks. With reference to the Westminster bell, he admitted that it would be more easily turned by Mr. Baker's plan than by his own; but the question was, whether it was worth while to adopt Mr. Baker's. He did not himself care about it, if Sir B. Hall liked to incur the expense.

The Chairman, Mr. Tite, M.P., regretted he was not present at the former meetings, as he felt much interest in the subject. At the Royal Exchange they had never succeeded in getting the bells in tune. There was no particular necessity to study expense, and he had been anxious to get a good chime of bells. At Messrs. Mears's works, he saw that the whole matter was traditional; and he therefore suggested that bells so roughly cast could hardly be in tune; and he further proposed to put the series in a row, and by striking ascertain whether the gamut could be produced. This trial, however, was declined; but as soon as the chimes began to play, the effect was highly disagreeable. In fact the peal was not in tune. Then came a series of suggestions, such as "the hammer strikes too hard;" but as Mr. Dent said, it was easy to make it strike softer, by merely shortening the lever. The architect and the tower were in fault; indeed, it was anything but the bells. At last it was agreed to take down the bells and re-cast them of a larger size, and with two additional bells; but the new bells failed. It was plain that the makers had no rule; yet they produced testimonials without number, and engaged that the bells should be in tune to the satisfaction of Mr. Edward Taylor, Gresham Professor. At first they insisted that the bells were in tune, but Mr. Taylor tested them with a violin to show that there could be no possible mistake. The bells were chipped, cut, and altered in every way without success, and he (the Chairman) never could get people to believe that *tons* was not *tune*. Mr. Taylor, of Loughborough, re-cast the bells, but without success, and he believed the chimes remained a failure. He had found in an old manuscript an illumination showing a man grinding bells, and he believed that the ancients in fact turned the inside of their bells in an accurate form with regard to the outside, according to some rule now lost. He believed that the same law or mathematical process by which he had seen Erard set out the top of a harp, might be applied to a bell, so as to conduce to its accurate tuning in any particular note.

THE ABUSE OF ALGEBRA.

BY DR. FRASER HALLE.

In several popular treatises we find other kinds of questions besides those mentioned in my former communication (vol. lxxiv., page 63), given to be solved even by an adfected quadratic equation which can also be determined by an arithmetical operation of the simplest character.

Some algebraists, indeed, seem to think that if a youth has only a nut to crack, he ought to be instructed to crack it by means of a steam engine.

In "Cassell's Algebra," among twenty-one questions producing adfected quadratic equations, we find the two following (Nos. 19 and 20; that is, as in the previous example, almost the last of the collection):

19. "Two church bells, whose loudness of tone are [*sic*] as p to q are a miles apart. Now, supposing the strength of sound to be inversely as the square of the distance, at what point between the two will the bells be equally heard? Ans., $\frac{a\sqrt{p}}{\sqrt{p}\pm\sqrt{q}}$ miles from the first, and $\frac{a\sqrt{q}}{\sqrt{p\pm q}}$ miles from the second.

20. "Two lights, whose intensities are as 25 to 9, are placed at the distance of 72 inches from each other. Find, on the line which joins them, the point which will be equally illuminated by each, admitting that the intensity of light varies inversely as the square of the distance? Ans., 45 inches from the large light, and 27 from less light, or 180 from large and 108 from smaller."

By the use of the literal forms in No. 19 the question is generalised, and by the substitution of bells and tones for "lights" and "intensities" in No. 20, we should have a particular question of the same species to be solved by the general formula.

The use of algebra is shown by the discovery of the general principle, expressed by its literal formula, and its abuse is strikingly exhibited in working such questions by the method indicated by their position in this treatise.

They belong to a class which is governed by a general principle published, curiously enough, at page 44 of the same work, but whose application to the forms under examination has evidently not been perceived by several algebraical writers.

These questions merely exhibit another form of the arithmetical one—

Find two numbers whose sum is 72 that are to each other as 5 to 3; and the rule will be—***Find a common multiplier for each of the proportional terms; by dividing the Sum by the sum of the terms.***

Applying this now to number 20, we have $\frac{72}{5+3}\times 5=9\times 5=45$, and $\frac{72}{5+3}=9\times 3=27$.

We have taken the square roots of the original proportionals, and the reason of this will immediately appear.

The tones are inversely as the squares of the distances; therefore, the square roots of the tones are inversely as the distances. But the latter equal the sum of the whole distance (No. 19) $\therefore x\sqrt{p}+x\sqrt{q}=a$. $\therefore$ $x=\frac{a}{\sqrt{p}+\sqrt{q}}=$ to the common multiplier $\therefore$ $\frac{a\sqrt{p}}{\sqrt{p}+\sqrt{q}}=$the greater distance and $\frac{a\sqrt{q}}{\sqrt{p}+\sqrt{q}}=$the less.

In the first question, however, the direction of the sound is limited. In the second the direction of the light is not limited to the intervening distance. The illuminated point then may be on a line extending from the greater light beyond the less. But the change merely of a sign of the fractional multiplier provides for this case also—

$\frac{72}{5-3}=36$ and $36\times 5=$the greater distance of the adfected quadratic and $\frac{72}{5-3}\times 3=108=$the less.

Here we had to find two numbers, whose *difference* is 72, that are to each other as 5 to 3. For this whole line must be equal to the greater distance, or, to 72 + the less distance.

$$\therefore x\sqrt{p}-x\sqrt{q}=a\ \therefore\ x=\frac{a}{\sqrt{p}-\sqrt{q}}.$$

In the algebra of Chambers's Educational Course, part ii., about two pages are devoted to show how to work a similar question by means of a quadratic. The distance here is 3 yards and the terms 4 to 1. The distances then will be $\frac{3}{\sqrt{4}+\sqrt{1}}\times\sqrt{4}=2$, and $\frac{3}{2+1}\times 1=1$; or $\frac{3}{2-1}\times 2=6$, and $\frac{3}{2-1}\times 1=3$.

Even if worked out as a quadratic we come almost at the outset to—

$$x\sqrt{p}=(a-x)\sqrt{q},$$

from a pure quadratic, easily worked; but this was not roundabout enough for the algebraists of the first named treatise. They instruct their "self-taught students for whom the work is principally intended," to work the question as an adfected quadratic; by which method the self-taught will come to—

$$x=\sqrt{\left(\frac{a^2p^2}{(p-q)^2}-\frac{a^2p}{p-q}\right)}+\frac{ap}{p-q}$$

not a trifling puzzle for those unskilled in the decomposition of $p-q$.

Among the pure quadratics of the same book is the following, which (and No. 167 simple equations) belongs to the same class as the foregoing question. "A and B carried between them 100 eggs to market, and each received the same sum. If A had carried as many as B, he would have received 12 pence for them, and if B had only taken as

many as A. he would have received 8 pence. How many had each? *Ans.* A 40 and B 60."

Now 100 being the sum, $\frac{100}{20} \times 12 = 60$, and $\frac{100}{20} \times 8 = 40$.

At page 43 we have another question reminding us of a well known example of "reduction" of £ *s. d.*, in Walkinghame's well known "Tutor." Here, in another form, it is exalted to a place among simple equations! "One carpenter, 12 journeymen, and 4 apprentices, receive, at the end of a certain time, 72 crowns. The carpenter received 1 crown per day, each journeyman half-a-crown, and each apprentice 15 pence. How many days were they employed? *Ans.* 9 days."

This, *à la* Walkinghame is, of course, $1+6+1$ crowns $\therefore \frac{72}{8} = 9$ days.

Some hints, we are told, in the preface to this work, are given in it to enable the industrious student to make discoveries for himself. One discovery the "self-taught and aspiring student" will doubtless make by means of its "important improvements on the ordinary method;" and that is, another way of making a mountain out of a molehill.

Erratum.—In former communication—*for* $6 \times 1 = 1$, *read* $6 \times 1 = 6$. F. H.

LONGMAID'S ALKALI PATENTS.

BEFORE THE JUDICIAL COMMITTEE OF THE PRIVY COUNCIL.

Thursday June 19, 1856.

Present.—Mr. Pemberton Leigh, Sir Edward Ryan, Sir John Patteson, and Sir William H. Maule.

This was an application for the prolongation of a patent for "Improvements in treating ores and other minerals, and in obtaining various products therefrom, certain parts of which improvements are applicable to the manufacture of alkali," granted to Mr. William Longmaid in October, 1842. The invention consisted in treating ores and minerals containing sulphur with such proportions of common salt that the ores were deprived of their sulphur, or nearly so, and the metallic products resulting from such process were rendered more suitable for subsequent processes for obtaining the metals therefrom, while at the same time the act of so treating them produced much larger quantities of sulphate of soda than had heretofore been obtained. The ores and minerals selected were particularly mundics, or iron pyrites, copper, lead, tin, and zinc. A transfer was made of the patent to the Plymouth Alkali Company, Mr. Longmaid retaining three 12th shares. Licenses were granted by the patentees to the St. Helen's Patent Alkali Company and to Messrs. Allen, of Newcastle, on the payment of certain royalties. The extension of the patent was opposed by the licensees. On the part of the patentees it was said that by this process sulphate of soda could be produced at a cost of less than one-half the ordinary mode of manufacture, and that if it were universally adopted there would be a saving to the community of 268,000*l.* per annum. On behalf of the licensees it was alleged, on the contrary, that the sulphate of soda produced by the patented process was not cheaper than by the ordinary method, while it was inferior in quality; that there was neither novelty nor utility in the invention; that the St. Helen's Company had lost upwards of 30,000*l.* in working the patent, and Messrs. Allen, 4,500*l.* in the manufacture, in addition to which they had expended 13,000*l.* on the plant. It was admitted, however, that if the royalties ceased, which, of course, would be the case on the termination of the patent, further efforts would be made to carry on the works. A great number of scientific and other gentlemen were examined in support of the statements of the respective parties.

Mr. Grove, Mr. Collier, and Mr. Webster appeared for the applicant; Mr. Watson and Mr. Hindmarch for the St. Helen's Company; and Mr. Atherton for Messrs. Allen.

Sir W. H. Maule, in delivering the judgment of their Lordships, said they were of opinion that there was some merit in the invention, but they were far from satisfied as to its utility. It was the duty of the applicant to substantiate that fact. He had not done so, and therefore their Lordships could not recommend the extension of the patent.

WHITWORTH'S ROAD-CLEANING PATENT.

BEFORE THE JUDICIAL COMMITTEE OF THE PRIVY COUNCIL.

Tuesday, June 17, 1856.

Present.—The same as in Longmaid's case, given in the preceding article.

This was an application on the part of Mr. Joseph Whitworth, of Manchester, for the prolongation of a patent granted to him August 2, 1842, for "certain improvements in machinery or apparatus for cleaning roads, and which machinery is also applicable to other similar purposes." The application was refused on the ground of the inutility of the invention.

LEE'S RAILWAY CARRIAGE PATENT.

BEFORE THE JUDICIAL COMMITTEE OF THE PRIVY COUNCIL.

Present.—The same as in the preceding case.

This was an application on the part of Mr. John Lee, of Southwark, for the prolongation of a patent granted to him, August 3, 1842, for "certain improvements in wheels and axle-trees to be used on railways and in other machinery, for stopping on, or preventing such carriages from running off, railways, which improvements may also be applied to other carriages and machinery." This application was granted in so far as relates to a portion only of the patent, and steps are to be taken by the Committee to prolong the said portion accordingly.

THE CHRONOLOGY OF GEOLOGY.

To the Editor of the Mechanics' Magazine.

SIR,—During some recent explorations in the Wealden formation, and more particularly in those parts which are developed in the vicinity of Hastings, I felt much interest in observing the fine stratifications of alternate sand and carbonized vegetable matter which appear at the foot of the cliffs to the eastward of that picturesque watering-place. That these strata are the deposits of an estuary or lake, is generally admitted. But why is it that in a depth of a single inch we perhaps meet with as many as ten or a dozen layers, alternately white and black, the former composed of sand, and the latter of lignite, or carbonized vegetable matter? How did it come to pass that in the placid depths of the Wealden lake there should first of all be formed one deposit and then another? Speculating on these points, I was led into considerations of the following character:

First. From the shores of the estuary or lake an accumulation of vegetable matter was swept down by the action of the rains, and carried into the adjacent waters. This vegetable matter descended ultimately to the bottom of the lake, where it formed a layer. At some subsequent period the action of the rains, or the tidal flow of an adjacent sea, carried in a quantity of sand, which formed a layer on the top of the vegetable matter. For the present we will not attempt to define the precise influence at work, but will just indicate our meaning. Suffice it to say, that by some alternating circumstances we have alternating deposits. In process of time, by the mutations of the ancient earth, these strata become embedded at a considerable depth. The gases evolved in the decomposition of the vegetable matter are thus unable to escape to the outer air. Heat is generated, as in a damp haystack, and the vegetable matter is blackened. At the same time, under the enormous pressure of the superincumbent mass (which gradually attains a vertical solidity of several hundred feet), the layers of vegetable matter are compressed into a very limited thickness, so that, when subsequently laid bare, they present the appearance of a very minute stratification.

Secondly. What are the alternating circumstances? These may be tides, flowing in or out of an estuary. The ebb tide brings down vegetable *débris* from the land, and the flow of the tide brings in sand from the sea. Or it may be that the alternating circumstances are simply the seasons. In the autumn and winter the trees cast their leaves; these are swept into the rivulets, and thence are carried into the lake. In the spring and summer the trees are clothed in green foliage, and falling leaves are rare, while at the same time occasional rains carry earthy matter into the deep waters. Either the tides or the seasons may be the cause of this alternating deposit. Furthermore, it seems that one or the other not only may be, but actually must be, the cause of the variegated strata referred to.

Thirdly. What deduction may we draw from these considerations? If we admit the tidal theory, then we deduce this result, —that each pair of layers is identified with a tidal revolution, and each double pair with an entire day, or at least very nearly so. According to this view of the case, if we find a rock of the description named, having a thickness of 5 feet, and an average of ten single stratifications per inch, we should reckon that, as the rock has 600 stratifications in all, and as four stratifications (speaking roughly) represent a day, so the formation of the rock in question occupied 150 days. I need hardly say that this theory appears too rapid for probability. If we adopt the idea that the stratifications are regulated by the seasons, we then deduce the result that each pair of strata represents a year. If such be the case, then a rock having a depth of 5 feet, with ten layers to the inch, would have required 300 years for its deposition, which certainly seems to be a much more likely period than the short interval of five months.

These considerations appear valuable to the writer, as affording some clue to the physical chronology of the ancient world. Perhaps a similar mode of argument applied to the phenomena of other rocks might lead to some interesting statistical results of a reliable character. In the case of aqueous rocks, strongly marked lines of deposit are generally visible; and perhaps if we proceed to inquire as to the reason of this, we shall be led to the conclusion that the alternation of summer and winter has given rise

to these appearances, by affecting the nature of the deposit, and causing it to vary in its component parts according to the season of the year.

In our inquiries into the chronology of geology there is one consideration which seems to throw a degree of uncertainty upon our investigation. Suppose the skeleton of Adam were placed before us, found preserved in some wonderful way in the superficial strata of the earth. If we had no knowledge of the identity of these bones, we might argue, from their constitution and magnitude, that they were those of a full-grown man, and that the living being to whom they once appertained must have passed through all the helplessness and physical insignificance of infancy, before arriving at this manly stature and development. The argument would have all the appearance of logical accuracy, and yet it would be really erroneous. If we altogether deny the testimony of Scripture on this point, we must admit the reasonableness of the presumption that the first man was not "born of woman," and that the first woman must have been motherless. Such being the case, we must allow that the first pair had an existence commencing at a later development than has since been the privilege of the human race. And if we admit that the first human pair came upon earth with a physical development only a single hour in advance of what is observed in an ordinary birth, the principle is thereby conceded, and we may as well admit that the progenitors of the human race entered the world in a state of physical maturity.

But we can even take lower ground, and can appeal to the evidences of science. In passing through the numerous groups of rocks which form our earth's surface, we find marks of distinct geological epochs. At different steps we find different creatures. In one epoch we find the monkey, or at least an analogous animal. Now, the first monkey was not born of a monkey, and we can trace no development of a monkey out of any preceding creature. Monkeys or mammalia appear suddenly, and we have no fact beyond that of their existence, unless we couple with it this consideration—that every creature must have a Creator, and therefore, by the introduction of a new genus, we have an evidence of creative power.

Nor is the argument confined to the case of mammalia. We find similar facts with regard to birds, fishes, vegetation, and all the forms of organised matter, whether possessed of animal or vegetable life. The first of everything capable of propagating its species must have been more perfect in its first appearance than was the case with its successors. And yet, in the internal organism of the first man, the first of the mammalia, the first pair, would there be any indication to show that these organisms had escaped the first periods natural to their existence? I believe not. If I am right in this belief, then it follows that science would be at fault in her deductions as to the duration of the individual organisms thus investigated.

If we admit (as I think we must) that Creation may thus anticipate Time, we should be careful in deducing periods from processes. If living creatures may be created perfect, may not inanimate organisms be subject to a similar display of power? At the same time we may admit that a distinction is to be drawn between the organisms which are animated with vegetable or animal life, and those which are deficient in these principles. The inanimate portions of creation may pass through their different processes in strict gradations, while the animated portions are called suddenly into existence just at those stages of material progress which suit the requirements of their more sensitive nature.

I am, Sir, yours, &c.,

Joseph Pitter.

254, High-street, Borough,
May 13, 1856.

TONNAGE REGISTRATION.

To the Editor of the Mechanics' Magazine.

Sir,—In your Editorial article on "Tonnage Registration," published in the *Mech. Mag.*, No. 1715, in connection with my letter of the 17th inst., inviting the Editor of the *Mech Mag.* to announce his decision, "and take a decisive part either in upholding our shipping registration system as it now is, or declare himself an advocate for its amendment," you have now most satisfactorily, because plainly, responded to this invitation by declaring your views as follow:—

"If we consent to give in our adherence to the principle of remitting any questions connected with shipping registration to the action of 'consultative deliberation,' they must be entirely by way of *addition* to, not of *alteration* of the registration clauses of the Merchant Shipping Act; so far, that is, as sailing ships are concerned." Then, as to the registration of steamers, "we believe the owners of sailing vessels generally feel this part of the law" (referring to the exclusive measurement of steamers) "as a great grievance; and we are, on the whole, disposed to concur in this opinion, which seems also to have been shared by the Tonnage Commission of 1849."

Then again, conclusively, "We should have no objection to see—or rather, we should say, we should see with satisfaction—

a competent committee appointed by the Government—or by the British Association, or some other scientific society, in the first instance, with a view of ultimately, if need be, acting on the Government—to take into consideration the following points."

These declarations, by the Editor of the *Mechanics' Magazine*, constitute grounds on which this discussion on tonnage registration ought, on my part, to be brought to a conclusion. I regard these declarations as displaying the candour, judgment, and desire to serve the public in the cause of science which have always characterised the editorial conducting of the *Mechanics' Magazine*, and thanking you, the Editor, for having given publicity to, and now so powerfully confirmed, my exposition of the deficiencies of our present system of statistical shipping registration,

I am, Sir, yours, &c.,
CHAS. ATHERTON.

Woolwich Dockyard,
June 23, 1856.

LOCOMOTIVE BOILERS.

To the Editor of the Mechanics' Magazine.

SIR,—I wish to pass a few remarks upon what I consider absurd ideas generally entertained in connection with the manufacture of locomotive boilers.

I visited a locomotive establishment lately where boilers were in course of construction, and all the makers aimed at was how much heating surface they could acquire; and to obtain this, in the first place, a water space was run transversely through the fire-box, perhaps partly to strengthen the fire-box, but principally to expose an extra 10 feet or 12 feet of surface to the action of the fire; and secondly, the tubes were placed almost as thick as a honeycomb, having only about 1¼ in. of space betwixt each pair, thereby causing a great waste of material in tubes and destruction of tube-plate. Now I believe all will agree that if a certain amount of heat be created in the fire-box, and just enough of surface exposed to absorb that heat, and prevent its passing up the chimney, the effect will be the same in generating steam as although double the extent of surface were exposed; and consequently all that extra surface is waste work and material. And again, I am certain that if twenty per cent. fewer tubes were put in, and those placed in regular horizontal and vertical rows, the same as is generally done in marine boilers, so as to allow a free circulation to the water, more heat would be absorbed in passing the same length of tubes (or twenty per cent. less surface). And again, should the tubes be insufficient to absorb all the heat generated in the fire-box (rather than resort to such an awkward affair as a water space), why not add a few inches to the length of the tubes, and thereby improve the general appearance of the engine, and tend to steady its running and reduce the first cost?

Perhaps some of your readers will say a few words on the subject; but I consider Bury's old-fashioned boiler, with round fire-box, the best and most economical of the present day.

I am, Sir, yours, &c.,
P. HUNTER.

June 17, 1856.

SHELLS THAT EXPLODE BY FALLING ON WATER.

To the Editor of the Mechanics' Magazine.

SIR,—I this day fired a paper shell, fitted on the head of an arrow, from the pier head, near the Rosherville Hotel, into the river where the water was 12 feet deep, in presence of several persons attendants at the pier. I shot the arrow *vertically*, so as to ensure the most direct fall on its head. The percussion or frictional appliance used is the same that I attach to my rifle-shell when I wish it to explode against loose flowing canvas, also for inserting in the bottom of the round iron bar for striking on the head of my percussion cartridge for blasting the roots of large trees in clearing forest land. Specimens of this appliance are to be seen in the museum of the United Service Institution, the Polytechnic, Regent-street, the Crystal Palace, and the Institution of Civil Engineers. About twelve years ago, when I successfully tested my spherical concussion shells, fired from the 8 in. and 10 in. bore guns from on board the *Excellent* gunnery ship, at Portsmouth, some of the shells exploded on striking the water. This resulted from the rivets in the fuzes having been too delicately set in their sockets, and was considered by the members of the committee to be a defect in the efficiency of the shell; but this facility of causing spherical shells to explode on striking the water will, in many cases, be of great utility, particularly for shells charged with Mr. Wentworth Scott's liquid fire, because a shell so exploding within fifty yards of an enemy's ship, would cause the liquid to fall like a shower of rain on the devoted ship. My next experiments will be to prove that I can cause percussion rifle shells to explode on striking the water, when fired from my three-groove four-pounder rifle cannon, which was formed perfect for use in the casting, without further preparation, with the exception of drilling the vent.

I am, Sir, yours, &c.,
J. NORTON.

Rosherville Hotel, May 31st, 1856.

P.S. This is the shell I also use as a signal to be discharged from a bow, pistol, or rifle, by the guard of a railway train from the rear over the train, when he wishes to signify to the driver of the engine that he is to draw up, go slow, or fast, &c. The report can be made as loud as that of a fog-signal; and there will be the report, a flash of fire, and a cloud of smoke, to arouse the attention of the driver of the engine.—J. N.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

PINCHES, J. *An improved machine or apparatus for embossing paper, metal, and other substances by hand.* Patent dated November 1, 1855. (No. 2440.)

This invention mainly consists in so constructing an embossing machine as to dispense with the necessity for employing the power of the lever or screw usually employed, and to substitute in lieu thereof percussive force.

KERR, R. *Improvements in spinning together fibrous materials of different kinds.* Patent dated November 1, 1855. (No. 2443.)

The essential feature of this invention is the causing of one yarn, of silk, for example, which has been prepared by throwing, spinning, or otherwise, to be combined with another yarn, such as a woollen yarn, as the latter is being spun, in order to avoid the subsequent doubling and twisting together of the two yarns in a separate machine.

NORMANDY, L. *Improvements in securing the rails in railways.* (A communication.) Patent dated November 1, 1855. (No. 2444.)

This invehtion consists in substituting rolled iron railway chairs for cast ones.

WALENN, W. H. *Certain improvements in pianofortes.* (A communication.) Patent dated November 1, 1855. (No. 2445.)

The object of this invention is mainly to dispense with the wooden blocks and all wood supports for the sounding board and wrest plank, and also with the heavy wooden bottom with which the case is commonly constructed, and to support and sustain the strings independently of the case, which is to be made so light as to be a mere shell enclosing the instrument, and with a thin bottom board which is connected by a sounding post with the sounding board, to strengthen and increase the vibratory power of the latter. One important feature of the invention consists in securing the sounding board within an independent metallic frame which holds it in an arched form.

TRUMAN, E. T. *Improvements in palates or holders for artificial teeth.* Patent dated November 1, 1855. (No. 2446.)

A full description of this invention was given on page 467 of our Number for May 17th, (No. 1710.)

BAGGS, I., and H. F. OSMAN. *Improvements in steam engines and in engines generally which are worked either by gas, air, or vapour, and in apparatus for generating electricity, for effecting parts of said improvements, and for other purposes.* Patent dated November 2, 1855. (No. 2447.)

This invention consists—1. In so constructing the slide valve of such engines that the steam may be worked more or less expansively by having at the ends of the slide valve additional sliding pieces, moved at proper intervals, and of such a size as to cover the ports when necessary. 2. In applying the power of magnetism to counteract the pressure, and so to diminish the friction of slide valves.

COTTRILL, J. *Improvements in machinery or apparatus for washing, scouring, dyeing, sizing, and cleaning woven fabrics and yarns.* Patent dated November 2, 1855. (No. 2448.)

The patentee passes and repasses the material to be operated upon in a continuous line through a cistern with compartments, and over rollers immersed in liquid flowing through the cistern. He also uses revolving agitators, placed between the rollers, the material being worked forward by a pair of squeezing rollers. The first compartment in which the cloth enters is made lower than that which follows it, for preventing the greater part of the dirt liberated at the first washing, from mixing with the liquid in the second compartment.

PATTERSON, J. *Improvements in mills or machines for grinding, crushing, cutting, and hulling or shelling various kinds of farm produce, and also for crushing and grinding minerals and other substances.* Patent dated November 2, 1855. (No. 2450.)

This invention consists in placing the rollers of rolling mills in such manner that the axis of each shall lie in a different plane to the other, for producing a compound or wrenching action in grinding; or in any modification of this arrangement.

COOK, R. *Improvements in apparatus for effecting the operations of punching, riveting, and shearing.* Patent dated November 2, 1855. (No. 2451.)

In this invention the necessary movements are obtained by a lever arm operated from a steam cylinder, carried by and forming part of the apparatus.

STAUFEN, W. *A substitute for hair and other substances commonly employed for stuffing cushions, furniture, and other articles.* Patent dated November 2, 1855. (No. 2452.)

This invention consists in substituting Mexican grass for hair.

COTTRILL, J. S. *Improvements in machinery or apparatus for washing, scouring, dyeing, sizing, and cleaning woven fabrics and yarns.* Patent dated November 2, 1855. (No. 2456.)

The patentee passes the material to be operated upon through grated oscillating agitators placed in a cistern with compartments, with a continuous stream of water flowing through, the material being worked forward by a pair of squeezing rollers.

HEGINBOTTOM, J. *Improvements in furnaces and apparatus for generating steam, whereby the smoke will be consumed and the fuel economised.* Patent dated November 3, 1855. (No. 2457.)

This invention consists mainly in forming of the sides and back part or bridge of the ordinary boiler furnace, or fire-place, a water space or auxiliary boiler, so arranged that the feed water on being supplied to the auxiliary boiler passes forward to the main boiler, as also the steam which is generated therein.

EASTWOOD, J. *Certain machinery or apparatus for taking out the slubs, noils, and knots from worsted sliver, slubbing, and roving.* Patent dated November 3, 1855. (No. 2458.)

This invention consists—1. In the use of a pair of revolving rollers or cylinders partly covered with cards, pins, or points, or any other suitable substance having a rough surface. 2. Of a series of fixed studs (with tubes or pulleys capable of rotating thereon to diminish friction), arranged in a zigzag line, for drawing the worsted sliver, slubbing, and roving in and out, through, or between the studs, in such a manner that the rollers with the cards, pins, or other substances may act upon the sliver, slubbing, or roving as it passes.

PATTISON, J. *Improvements in machinery for dressing and finishing woven goods and fabrics.* Patent dated November 3, 1855. (No. 2459.)

This invention relates to improvements upon a former patent, dated 5th Feb., 1855, and consists in using instead of the single stationary drying cylinder, a compound or divided drying cylinder, consisting of two or more parts, of equal diameter, capable of rotating independently round the same axis or hollow shaft.

DAVIS, G. *Improvements in apparatus for letting in or shutting off water or other liquids.* Patent dated November 3, 1855. (No. 2460.)

This invention consists—1. Of improvements upon a former patent, dated 8th Nov., 1854. 2. Of an improved apparatus, having for its object the prevention of an undue flow of water into the pans of water-closets. 3. Of a novel arrangement of basin and trap for water-closets, to be used either together or separately.

ROBERTSON, W., and J. HENRY. *Improvements in machinery for reaping and mowing corn or other agricultural produce.* Patent dated November 3, 1855. (No. 2462.)

The patentee describes a machine which may be driven either by manual power or by steam. On one of the driving wheels is fixed a toothed ring, from which motion is communicated through a pinion and other spur gear, to a crank, which, by means of a connecting rod, is made to act upon one end of a beam, to the opposite end of which is connected a rack, the backward and forward motion of which works the cutter. This cutter is a long thin serrated blade, set at a slight angle to the machine, and suspended from a pair of slings, to one of which the said motion is communicated.

GREENSHIELDS, J. *Improvements in the manufacture or production of drying oleaginous compounds.* Patent dated November 3, 1855. (No. 2464.)

This invention relates to the use of the oil which is produced by the distillation of resin or resinous matter, in combination or after treatment with manganese, oleaginous matter, or other drying substances, for the production of a dyeing substance suitable for waterproofing purposes, as well as for general protective coatings and pigments. The oil preferred for mixing with the resin oil is linseed oil.

BRIDSON, T. R. *Improvements in preparing, beetling, or finishing textile fabrics.* Patent dated November 3, 1855. (No. 2465.)

This invention relates to a mode of treating textile fabrics, in such manner as to produce a beetling or finishing effect entirely by rotary action upon the goods.

GARDNER, W. *An improved method of manufacturing watches or other time-keepers, and also improvements in the machinery, tools, or apparatus for accomplishing the same.* Patent dated November 3, 1855. (No. 2466.)

This invention consists—1. In making certain principal separate parts of watches, &c.—that is, the plates—of one equal and fixed size and form for each series, which is accomplished by certain described apparatus. 2. In forming apparatus to be applied to the ordinary lathe, as an indicator for showing and determining the thicknesses and diameters of the plates, and also the depths of the recesses formed therein. This indicator consists of a small case or box, on the upper plate of which are dials and indices for registering the depth of the cut or drill of the tool.

SHARP, W. P., and W. WEILD. *Improve-*

ments in the reeling or winding of cocoons, and in the manufacture of silk threads, and in machinery and apparatus for these purposes. (Partly a communication.) Patent dated November 3, 1855. (No. 2467.)

This invention relates—1. To a mode of winding double cocoons, which will not wind continuously in the ordinary manner on account of the filaments being entangled with each other. The method consists in first placing a quantity of such cocoons in a vessel containing water at a high temperature, and passing the filaments from a number of them through an eye to bring them together, and thence onward to a reel or surface upon which the thread formed by their combination is to be wound. 2. To certain arrangements of guides in reeling cocoons which, when one of the sets of filaments breaks in passing on the reel, will cause the other set of filaments at the same moment to cease from winding on to it. 3. To a method of winding and preparing silk to be spun into thread, having the character of organzine or tram. It consists in winding direct from the cocoons on to bobbins, combining with the operation the method of "crossing" to unite filaments of the cocoons together. 4. To certain arrangements in machines for winding silk on to bobbins, by which the tension upon the threads can be readily adjusted, which arrangements consist in passing the threads over rods to form with each other an angle, the increase or diminution of which (accomplished by making one of the rods moveable on an axis) will add to or diminish the tension on the threads.

Allman, F. *Certain improvements in apparatus for the production of steam.* Patent dated November 3, 1855. (No. 2468.)

In the patentee's arrangement three vessels are used—the boiler, chamber, and calorifier. The steam is generated from the water in the boiler, and thence is emitted into the chamber which it fills, but which has a valve which is opened into the third vessel or calorifier, after the valve leading from the boiler to the chamber is shut, so that only the amount of steam contained in such chamber can at one opening of the valves be admitted from the boiler through the chamber into the calorifier.

Collier, G. *Improvements in weaving carpets and other pile fabrics.* Patent dated November 3, 1855. (No. 2470.)

These improvements relate — 1. When using fixed wires (that is, wires affixed to their carriers), to applying at the selvage of the fabric a moving instrument to act in succession upon the wires, for the purpose of conducting their points as withdrawn from the fabric correctly into the open shed. 2. To forming the shuttle-box on the side of the loom where the wires are introduced and withdrawn separate from the batten. 3. To a mode of arranging the motion to the batten to effect an elastic beat-up in the weaving of plush and other light pile fabrics. 4. To apparatus for operating pile wires by the use of a cylinder with grooves containing a series of them, such as those recently patented by William Weild. 5. To effecting the withdrawal of the pile wires by means of a screw, this screw being cut both ways.

Garden, R. S. *Improvements in the manufacture of hats.* Patent dated November 5, 1855. (No. 2473.)

The patentee effects the ventilation of hats or caps by inserting between an inner lining or band, and the hat itself a thin layer of cork, or any suitable light substance, furnished with apertures to admit air, which, passing upwards, pervades the whole interior, and escapes at openings at the top or crown. The patentee's mode of strengthening hats is adapted for helmet-shaped hats, and consists in applying thereto a spring or springs of a cross or star-shape, cut out of sheet metal.

Hicks, J. *An improved gauge-valve, applicable to boilers of steam engines and to other purposes.* Patent dated November 5, 1855. (No. 2474.)

This invention requires engravings to illustrate, and will, perhaps, be given hereafter.

Dobson, A. *Improvements in preparing certain unbleached linen fabrics.* Patent dated November 5, 1855. (No. 2475.)

This invention consists in imparting to fabrics in the brown or unbleached state, made of inferior flax, the appearance of fabrics made of superior flax, by steeping the fabrics to be operated upon in the ordinary manner, and then submitting them to the action of an infusion of straw, hay, the roots or plant of hemlock, or the plant or seeds of flax or hemp.

Hawkes, F., the elder. *Improvements in the construction and arrangement of water-closet apparatus.* Patent dated November 5, 1855. (No. 2476.)

The inventor describes an apparatus in which all the mechanical appliances, except the attachment of the flushing pipe, are perfectly freed from, and independent of, the closet pan.

Page, H. C. *An improved method of indurating marble and stone, and of permanently fixing colours therein, when colouring matters are applied thereto for producing a variegated pattern or devi ce on the surfa thereof.* Patent dated November 5, 1855. (No. 2478).

To indurate light coloured stone and marble the patentee proceeds as follows:—

With a soft brush or sponge he wets the surface with a solution of two parts of lime and one pearlash; he then exposes the stone to a gradual heat until it is dried through, and has become sufficiently hot to melt white bees-wax, which he next passes quickly over the surface thereof. The process for producing a variegated pattern or device in colours on marble and stone is as follows:—The surface should be clean and fine, but not polished, and the colouring matters are applied thereto, and are disposed according to the taste of the artist, after which the stone is subjected to a sufficient degree of heat to melt wax when applied thereto, and when wax is so applied the colouring matters become perfectly fixed.

BURRIDGE, G. *Improvements in the preparation of glass for ornamental purposes.* Patent dated November 5, 1855. (No. 2481.)

By his process the patentee proposes to colour the glass on both sides, each side of a different colour, or he employs two sheets of glass of different colours, pressed together or otherwise united.

MCGREGOR, P. *Improvements in water-closets.* Patent dated November 5, 1855. (No. 2482.)

This invention relates to water-closets for ships. In addition to the usual clack-valve in the bottom of the soil-pan, there is a secondary valve in the lower part of the discharge passage, worked in concert with the upper valve. The two valves are connected together by spindles and levers actuated by a single handle. This connection is so made, that when the discharging handle is pulled the lower valve is first of all closed, shutting off all communication with the sea. Then, as the handle is pulled further up, the soil-pan valve above is opened, and the cleansing water is let on.

COMPLETE SPECIFICATIONS FILED WITH APPLICATIONS.

HERBERT, J. A. *Improvements in propellers for propelling steam-ships or other vessels, and which are denominated the "Whinfield or Conical Propeller."* (A communication.) Dated October 11, 1855. (No. 2271.)

The improved propeller consists of two circular wheels or discs, with or without arms, having open spaces for the paddles or buckets to turn, and so constructed and set, that their axes or shafts stand at about 150° from each other, and that the peripheries of the discs or wheels nearly touch each other at one point, while their faces diverge from each other at about 30°, in consequence of the inclination of their axes.

BASFORD, W. *Improvements in the purification of coal gas, and for obtaining a residuum therefrom.* Dated October 19, 1855. (No. 2345.)

This invention consists—1. In the separation of the impurities from gas made from coal by passing the gas through charcoal saturated in lime water and heated. 2. In the formation or deposit of a residuum derived from the gas that may be used as a pigment or colour.

LEROUX, P. A., and L. R. MARTIN. *Combining a resinous matter with oils or fatty bodies in order to obtain various useful products therefrom.* Dated October 22, 1855. (No. 2362.)

This invention consists—1. In the solidification of all oleaginous and fatty substances, either vegetable or animal, by means of the resin called Carnaubat resin. 2. In the application of the same resin to the manufacture of candles, soap, and also lubricating purposes.

BELLFORD, A. E. L. *Improvements in sewing-machines.* (A communication.) Dated November 1, 1855. (No. 2442.)

This invention consists—1. In a looper of a novel kind, operating in combination with a needle to form a stitch with a single thread. 2. In a certain method of operating the needle in connection with the aforesaid looper to throw the thread over its point. 3. In certain mechanical means by which the said method of operating the needle is accomplished. 4. In an improved feed motion for feeding the cloth in the line of the seam to receive the successive stitches.

LEWIS, J., and J. EDWARDS. *Improvements in malt-crushers.* Dated November 2, 1855. (No. 2454.)

This invention consists in the application to malt-crushers of a certain lever, with parts in connection therewith, for driving the rolls.

WALENN, W. H. *An improved mode of flattening cylinder glass.* (A communication.) Dated November 5, 1855. (No. 2479.)

This invention consists in flattening the glass cylinder by an instrument constructed with wings, which is inserted into the cylinder with the wings closed while the cylinder is in the flattening furnace, and as the glass becomes soft from heat, has its wings spread out, thus causing the cylinder to assume a form having flat sides.

WHIPPLE, C. *Improvements in machinery for preparing and combing fibrous materials.* Dated November 8, 1855. (No. 2519.)

This invention consists in so combining machinery that the fibres, after being fed into or received amongst teeth (set in a suitable surface), have their ends raised out from the teeth and cleansed, the cleansed ends of the fibres being then nipped and drawn amongst the teeth, in order to cleanse the other ends, and also to separate this quantity of fibres from the other fibres

amongst the teeth; the protruding ends are then deposited amidst the teeth in such manner that they overlap the ends of the quantity of fibre which has been treated, thus admitting of the combed fibres being doffed or drawn off from the teeth in a continuous sliver.

GREEN, E. and J. *Improvements in malt-crushers.* Dated November 10, 1855. (No. 2533.)

These improvements consist in enclosing the working parts of malt-crushers, so that whilst the machine is in operation, the malt dust, which would otherwise fly off and be lost, is retained.

TOLHAUSEN, A. *Making metallic chains.* (A communication.) Dated November 21, 1855. (No. 2623.)

The chain which the improved machine described is intended to manufacture, is what may be termed a "double-linked" chain, as it is composed not of pairs of links, but strictly of double links, which are each formed entirely of one piece of metal. The machine itself cannot be well described without illustrations.

POULSON, E. *A new constructed engine to be worked either by steam or principally by manual labour.* Dated December 6, 1855. (No. 2747.)

The following is the whole of Mr. Poulson's specification! "My invention consists of a new constructed engine for marine locomotives and standing engines, to be worked either by steam or principally by manual labour by a suspended lever, or a new constructed fly-wheel charged with quicksilver, as the case may be; that is to say, as fly-wheels are not convenient to work on ship-board in a gale of wind or a hurricane, the engine may be worked by manual labour only, and the action of the engine from the motive point of power is by an action and reaction."

MALBEC, J. E. DE. *Certain improvements in water-closets.* Dated December 11, 1855. (No. 2792.)

This invention relates principally to the closing apparatus or obturator, and the manner in which water is supplied. The obturator consists of a nearly cylindrical basin, a valve of peculiar form, and a rocking mechanism enclosed in a case. These two last are chiefly claimed as the invention, as through them the water on the valve is made to close both the basin and the case-hole.

ROGERS, E. *Improvements in safety-doors for mines.* Dated December 15, 1855. (No. 2835.)

This invention consists—1. In connecting a pair of safety-doors (each opening outwards from the space included between them) by a cord or chain, attached by its extremities to the upper part of each door at a convenient distance from the hinge, and of such a length as to be fully extended when one door is shut and the other is wide open. 2. In hanging upon or attaching to some part of the said cord or chain a weight or a spring sufficient to close either door, when, being open, it is left free.

PORTEOUS, D. S. *Regulating the pressure of gas, steam, water, or other fluids.* Dated December 20, 1855. (No. 2880.)

This invention mainly consists in the use of a flexible regulating cover of India-rubber, or vulcanized India-rubber, or a flexible metallic regulating cover, for the regulation of the pressure of fluids.

WORTHINGTON, H. R. *A machine for measuring the flow of liquids, called a fluid meter.* Dated January 16, 1856. (No. 122.)

Claim.—The employment of two cylinders in the construction of a meter for fluids, which may be designated as cylinders A and B, with pistons fitted to work in the same, so arranged and combined with regard to each other, as that the motion of the piston in cylinder A shall at the proper time actuate the supply and delivery valve of cylinder B, while in like manner the piston moving in cylinder B shall actuate the supply and delivery valve belonging to cylinder A.

ROBSON, J. W. *Improvements in machinery appertaining to water-closets and pumps.* Dated January 21, 1856. (No. 160.)

These improvements consist—1. In casting two tubes and a cylinder in one piece. 2. In the manufacture of a diaphragm (by which a vacuum is produced answering all the purposes of a solid piston) of leather, India-rubber, and gutta percha. 3. In a self-acting service for water-closets.

PORTEOUS, D. S. *A rotatory engine.* Dated January 22, 1856. (No. 170.)

Claims.—1. The combination of the parts described as a whole. And separately, the using of two, three, or more cylinders, when wrought with flaps as resisting abutments of steam water or gas, when either is used as a propelling agent. Also the using in a rotatory engine flaps made with a different curve to the internal circle of the cylinder. Likewise the using of a hollow cylindrical valve, when such is used as a part of a rotatory engine. 2. The use of a rotatory pump as described.

DUNCAN, J. W. *Improvements in or connected with apparatus for the generation and application of steam for impelling purposes.* Dated February 9, 1856. (No. 345.)

The first part of this invention relates to the introduction of certain material between the steam generator and the engine, to pre-

vent the passage of water with the steam to the engine. For this purpose is placed in the steam chest, or in a suitable chamber, a quantity of waste wire, or of fine metal cuttings, the result and waste of some previous purpose. A quantity of similar cuttings or wire is employed in a chamber between the steam cylinder and the condenser. The invention also comprises other minor features.

VEREL, W. A. *Improvements in grinding or pulverizing hoofs and horns, and in using them alone or mixed with pulverized bones for manure.* Dated February 20, 1856. (No. 423.)

This invention consists in drying the hoofs and horns until they are sufficiently brittle; they are then broken into small pieces, after which they are ground between stones, and finally passed through a sieve or sifter. In some cases this product or powder is mixed with ground or pulverised bones prepared as described in a former patent, dated November 23, 1854, or otherwise, so as to adapt the article for use as a manure in various soils.

ARNIER, L. *Improvements in condensing hot air and obtaining motive power therefrom.* Dated February 25, 1856. (No. 481.)

The improved apparatus consists—1. Of a rarifier in which air is heated. 2. Of a cylinder with a driving piston acted upon by air coming from the rarifier. 3. Of a condenser which sucks the air out of the driving cylinder. 4. Of an air-pump which sucks the air out of the condenser.

McCARTON, W. *Improvements in the drying of corn or grain for grinding and preserving, and apparatus for performing same, and is applicable to drying of other seeds.* Dated March 13, 1856. (No. 614.)

These improvements consist in the use of an outer and an inner wove wire or perforated metal case, arranged so that while the corn or grain is passing in a downward direction by the force of gravity, and between the said cases, a column of hot air of the desired temperature is made to ascend from a suitable furnace into the hot-air chamber, passing from it through the outer wire or perforated case, through the corn or grain, and into the inner wire or perforated case, and thence to the atmosphere by the eduction flue.

OCHS, L. *Improvements in the manufacture of certain kinds of paper from the refuse of tanned leather.* (A communication.) Dated March 19, 1856. (No. 650.)

In order to render such waste fit for making coarse packing paper, it is necessary to extract the "tannin" therefrom, and this is effected by passing the pieces through a cylindrical sieve or riddle, the meshes or openings in which are a quarter of an inch apart. After the waste or refuse has undergone the above operation, old rope or cord is cut up into pieces, and has its fibres separated, and about 20 per cent. of the fibre so obtained is mixed with the leather treated as above explained. The whole is then placed in a mortar or other suitable vessel, and the mass is beaten into a pulp, from which paper may be made in the usual manner.

DUMERY, C. J. *Improvements in smoke-preventing apparatus.* Dated March 27, 1856. (No. 739.)

This invention consists—1. Of an apparatus with stationary radii for propelling the fuel in the furnace. 2. Of certain moveable surfaces which allow the fuel to be introduced through moveable frames, without the interference of any propeller.

BANCROFT, P., and S. WHITE. *A method of manufacturing certain oils or oily substances obtained from the petroleum, commonly called earth oil, found in certain districts of the Burman empire and elsewhere.* Dated April 10, 1856. (No. 862.)

The inventor describes a number of successive distillatory processes in which steam, &c., are employed.

NORMANDY, L. *Improvements in the mode of writing and printing music to facilitate the study thereof.* (A communication.) Dated April 11, 1856. (No. 868.)

The lines of the musical scale used in this mode of writing are of several colours.

BOUSFIELD, G. T. *Improvements in surface or fresh water condensers, chiefly applicable to steam engines.* (A communication.) Dated April 15, 1856. (No. 900.)

This invention consists—1. In securing a tube, or a set of tubes united by a single collar, to a tube sheet, by means of a short tube of vulcanised India-rubber or its equivalent, and a socket or thimble upon the tube sheet. 2. In combining several small tubes by means of a collar to which they are firmly attached, when the said collar is secured to a tube sheet by some flexible or sliding junction. 3. In combining with a short India-rubber tube, making a peculiar joint, two or more spring rings or their equivalents as set forth.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BEAUMONT, H. B. *Improvements in portable dwellings or huts, vehicles and boxes, or packing materials for travellers.* Application dated November 1, 1855. (No. 2434.)

This invention consists in the construction of dwellings or huts of materials affording mutual support to each other, requiring but few extraneous fastenings, and such as may readily be converted into boxes, and the bodies of carts or waggons, for use in the

course of transit, to be afterwards again formed into dwellings or huts, the method of connecting the materials being chiefly by a series of grooves and ridges, with the assistance of a few bolts.

NICOLE, D. L. A. *Improvements in apparatus for winding up watches.* Application dated November 1, 1855. (No. 2438.)

This invention consists in applying a toothed wheel to the inner case or plate of a watch, that it may be made to rotate by a toothed wheel fixed on the stem of the knob, or on a spindle passing through the knob; and by another wheel, which gears into the toothed wheel carried by the inner case, motion is given to wind up the watch.

BENTHAM, J. *Improvements in looms for weaving.* Application dated November 1, 1855. (No. 2441.)

This invention consists in causing a projection from the throwing off motion to act with an opening to each shuttle-box through the face of the batten or going part, which openings are capable of being closed by a plate when the shuttle fails properly to box, but are clear by the removal of the plates therefrom when the shuttle properly boxes. The improvements relate also to the letting-off motion, and consist in applying a band of India-rubber to pass partly round the warp upon the warp beam, thereby to give motion to the beam by frictional contact, whilst it is also capable of yielding to the varying diameter of the beam of warp, the band having the requisite motion given to it for the let-off in any suitable manner.

OSBORNE, M. *Improvements in metallic bedsteads and other articles of metallic furniture.* Application dated November 2, 1855. (No. 2449.)

The inventor makes the vertical pillars and horizontal rails of the said bedsteads of metallic tubing, and connects the same together by means of corner blocks. The laths constituting the sacking are secured to the side rails by means of certain cast pieces, &c.

HESELTINE, S. *Improvements in the means of ascertaining the depth of water in rivers, harbours, and at sea.* Application dated November 2, 1855. (No. 2453.)

This invention relates to a mode of ascertaining the depth of water by the pressure of the vertical column upon air confined in a sunken vessel or reservoir.

JONES, J. *Improvements in electric telegraphs.* Application dated November 2, 1855. (No. 2455.)

The improved telegraph consists of three principal parts, viz., the apparatus for transmitting, the receiving or recording part, with a third part, which may or may not be used, its object being to elevate and liberate the pencil fixed in the receiving instrument, so as to prevent unnecessary marks being made on the paper.

COOPER, T. R. *Obtaining motion with power and velocity by purely mechanical means.* Application dated November 3, 1855. (No. 2461.)

In this invention motion is obtained "by a certain combination and position of machinery not hitherto known or adopted, and according to the structure of the said machinery the requisite power and velocity are also obtained."

BINNING, J. *Improvements applicable to embossing presses.* Application dated November 3, 1855. (No. 2463.)

This invention relates mainly to small presses for embossing seals and so forth upon envelopes, paper, &c., and consists in constructing the presses so that the impression is taken from the die by means of percussion, the blow being given by the hand only, or by being struck with a small mallet, and so that the die can be turned aside to receive colour upon its face.

LLOYD, G. *Improvement or improvements in illumination.* Application dated November 3, 1855. (No. 2469.)

This invention consists in adapting the burners of lamps, valves, or other mechanism for regulating the amount of air supplied to the flame.

BROOMAN, R. A. *Improvements in knitting-machinery.* (A communication.) Application dated November 3, 1855. (No. 2471.)

In the making of wearing apparel, as stockings, shirts, drawers, &c., a model is formed, which is attached to the knitting-frame, by which certain movements are accomplished whereby the effect produced is to weave a web the counterpart of the said model.

PROVISIONAL PROTECTIONS.

Dated March 22, 1856.

689. Charles Carey, of Union-grove, Wandsworth-road, Surrey. An improvement in omnibuses.

Dated April 23, 1856.

969. Isaac Myers and George Myers, of Rotherham, York. An improved fire-lighter.

Dated April 25, 1856.

997. Robert Lakin, of Stretford, Lancaster, machinist, John Thompson, of Ardwick, Manchester, foreman, Edward Gerrard Fitton, of Ardwick, foreman, and Frederick Alexander Fitton, of Ardwick, mechanic. Improvements in or applicable to certain machines, for preparing and spinning cotton and other fibrous substances, some of which improvements relating to apparatus for lubricating, and to the construction of studs, are also applicable to machinery for other purposes.

Dated May 13, 1856.

1123. Alexander Parkes, of Birmingham. Improvements in the use of collodion in photography.

Dated May 14, 1856.

1145. William Evans, of Sherston, Malmesbury, Wilts. An improved description of plough.

Dated May 16, 1856.

1160. Joseph Martin, of Liverpool, Lancaster, miller. Improvements in machinery for draining or partially drying certain descriptions of wheat and other grain.

Dated May 21, 1856.

1199. Robert Pemberton, of Hildenborough, Tonbridge, Kent. Improvements in barrel organs.

Dated May 23, 1856.

1236. John Gedge, of Wellington-street South, Strand, Middlesex. Improvements in the means of adjusting the parts of ladies' dresses called crinolines and sous-jupes. A communication from J. L. Cerbelaud, of France.

Dated June 2, 1856.

1299. Gustavus Gidley, of Clinger-street, Hoxton, and William Christopher, of Oak-villa, Pinner, Middlesex. Reducing the bottle or imported India rubber to a transparent liquid state, so that it may be used as a transparent varnish or solution for mixing with colours.

1307. Delia Avery, of Essex-street, London. Improvements in the construction of bonnets and other coverings for the head.

1312. George Hallen Cottam and Henry Richard Cottam, of St. Pancras Iron Works, Old St. Pancras-road. An improvement in the manufacture of iron hurdles.

Dated June 4, 1856.

1325. Thomas Morris, of Bunny, Nottingham, farmer. An improved trap for beetles and other insects.

1326. Frederick Albert Gatty, of Accrington, Lancaster, manufacturing chemist. An instrument to be used in lighting and holding matches or vesta lights.

1327. Adam Bullough, of Blackburn, Lancaster, manufacturer. Improvements in the mode or method of leasing warps.

1328. William Potts, of Handsworth, Stafford, manufacturer. Improvements in sepulchral monuments.

1329. Reuben Boyce Wigley, of Birmingham, Warwick, manufacturer. A new or improved method of attaching handles to coffins.

1330. Edward Hatton, of Birmingham, Warwick, metallic bedstead manufacturer. Improvements in the manufacture of plain and ornamental metallic tubes.

1331. Duncan Morrison, of Bordesley Works, Birmingham. Improvements in the manufacture of metallic bedsteads and other articles to sit or recline on.

1332. Charles Louis Marie, of Hôtel du Continent, Leadenhall-street, London. Improvements in preserving animal and vegetable substances suitable for food.

1333. Duncan Morrison, of Bordesley Works, Birmingham. Improvements in the manufacture of articles from malleable cast iron.

1334. John Christophers, of Heavitree, Devon. Improvements in knives and forks whose handles are not metallic.

1335. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in plating glass to render it reflective. A communication.

1336. William Smith, of Margaret-street, Cavendish-square, Middlesex, engineer. Improvements in apparatus for regulating the supply of air to furnaces.

1337. Alexandre Louis Gibon and André Fröhlich, of Rue de l'Echiquier, Paris. Certain improvements in economising fuel in the treatment of metals.

Dated June 5, 1856.

1338. John Betts, of the Strand, Middlesex, publisher. Improvements in the preparation or manufacture of artificial spheres.

1339. John Norris, jun., of New York, in the United States of America, gentleman. An improvement or improvements in the manufacture of the cutting tools employed in nail making machines. A communication.

1340. Jules le Breton, of King's Arms-yard, Coleman-street, London. A photo-gas or apparatus, with air-draughts of hot oxygen when applied to oil-lamps, with wicks for lighting and heating. A communication from F. A. C. Jeune, of Paris.

1341. Andrew Edmund Brae, of Leeds, York. Improvements in apparatus for communicating signals from one part of a railway train to another.

1342. Archibald Sinclair, of Birmingham, Warwick, engineer. An improvement or improvements in wrought iron pins for railway chair fastenings.

1343. William Watson Hewitson, of Headingley, near Leeds, and William Hamond Bartholomew, of Brunswick-terrace, Leeds. Improvements in the construction of the furnaces or fireboxes of tubular steam-boilers.

Dated June 6, 1856.

1345. Duncan Lang, of Greenock, Renfrew, N.B., engineer. Improvements in obtaining and applying motive power.

1346. Joseph Robinson, of Hyde, Chester, builder. Improvements in railway chairs, or in means for securing rails thereto.

1347. Charles Beyer, of Gorton, near Manchester, Lancaster. Improvements in locomotive engines.

1348. Robert Harlow, of Stockport, Lancaster, brass-founder. Improvements in the construction of water-closets, and in valves or taps for water-closets and other purposes.

1349. James Somerville, of Glasgow, Lanark, N.B., manager. Improvements in weaving.

1350. Charles Durand Gardissal, of Bedford-street, Strand, London. Improvements in machinery for extracting fibrous and other products from vegetable substances. A communication.

1351. John Juckes, of Dame-street, Islington. Improvements in the furnaces of locomotive boilers.

1352. Thomas Chambers, of Colkirk, Fakenham, Norfolk. Improvements in agricultural drills.

1353. Peter Armand Lecomte de Fontainemoreau, of Rue de l'Echiquier, Paris, French Empire. Certain improvements in heating water for steam boilers. A communication.

1354. Alfred Vincent Newton, of Chancery-lane, Middlesex. Certain improvements in rotary engines. A communication.

1355. Paul Ellison, of St. Helen's, Lancashire, manufacturing chemist. Improvements in furnaces, and the mode of working the same, for the manufacture of black ash or crude soda.

Dated June 7, 1856.

1356. Adam Stamm, of Buenos Ayres, South America, engineer. Improvements in presses for packing, parts of which improvements are also applicable to other presses.

1357. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved furnace for heating soldering irons. A communication.

1358. William Edward Wiley, of Great Hampton-street, Birmingham, pen and pencil manufacturer. Improvements in the manufacture of metallic pens and pen-holders.

1360. Samuel Dyer, Bristol, shipowner. Improvements in reefing, furling, and setting the

sails of ships and vessels, also for protecting such sails from wet and other abuses caused by ropes and rigging.

Dated June 9, 1856.

1361. Alexander Robertson, of Dublin, surgical instrument maker. An improved inkstand.

1362. Joseph Bennett Howell, of Sheffield, York, steel manufacturer. Improvements in the manufacture of cast-steel tyres for railway locomotive engine and carriage wheels.

1363. Charles William Siemens, of John-street, Adelphi, Middlesex. Improvements in engines wherein superheated steam is used.

1364. William Field and Edward Jeffreys, both of Shrewsbury, Salop, gentleman. Improvements in machinery for sowing seed and for distributing manure.

1365. Robert Ferrier, of Jedburgh, Roxburgh, N.B., smith and machine maker. Improvements in machinery or apparatus for sweeping and cleansing roads and streets.

1366. James Holdin, of Manchester, Lancaster, paper manufacturer. Certain improvements in machinery or apparatus for washing rags, which said improvements are also applicable for washing other materials.

1367. James Holdin, of Manchester, Lancaster, paper manufacturer. Certain improvements in machinery or apparatus for bowking, bleaching, dyeing, and washing textile fabrics or materials.

1369. John Ellis, of Heckmondwike, York, surgeon. Improvements in the manufacture of muriate of ammonia and carbonate of ammonia, and in converting certain ingredients employed therein, into an artificial manure.

1370. Benjamin Smith and William Kalthoff, of Gemünd, near Cologne, Prussia. Improvements in economising fuel in the locomotive and other steam-engines.

1372. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in ladies' wearing apparel. A communication from P. M. Hebert, of Paris.

Dated June 10, 1856.

1373. Thomas Skaife, of Vanbrugh-house, Greenwich, Kent. Spring-folding camera shutters for the more speedy and convenient mode of taking photographic pictures than has been hitherto adopted.

1375. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in printing shawls and other fabrics, and in the machinery employed therein. A communication from Mons. Herrmann.

1379. Charles Rowe Cheshire, of Liverpool, Lancaster, anchor manufacturer, and Joseph Betteley, of the same place, anchor manufacturer. Improvements in the manufacture of anchors.

1381. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improvement in projectiles for ordnance. A communication.

PATENT APPLIED FOR WITH A COMPLETE SPECIFICATION.

1410. Hector Grand de Châteauneuf, of Paris, France, civil engineer. Improvements in apparatus for washing and bleaching clothes and other materials, to be called "The Steam Washing Lixiviateur." Dated June 14th, 1856.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," June 24th,* 1856.)

365. William Frederick Collard Moutrie. An improvement in the damper action of piano-fortes.

389. George Gulliver and John Goldthorpe. An improved signal bell.

391. Edward Oldfield. Certain improvements in self-acting mules for spinning.

397. John Henry Johnson. Improvements in fountain pens. A communication.

407. Henry Hodgkinson. Improved machinery or apparatus for bleaching cotton, linen, and other woven or textile fabrics.

414. Frederick Austin Spalding Witter. An improved stove. A communication.

426. William Muir. Improvements in slide lathes.

428. William Lynn. Improvements in the construction and mode of applying screws for propelling vessels.

435. Jeremiah Clark. Improvements in apparatus for stopping or closing bottles, jars, and other similar vessels.

440. Isaac Moll. The treatment of sulphate of alumine of commerce, and its formation of compounds useful for the disinfecting of organ substances in a state of putrefaction, as well as for other purposes.

442. Jacques Henri Marie Maissiat. Improvements in projectiles for fire-arms.

459. Georges Toucas. A new metallic alloy.

462. James Edward Boyd. Improvements in scythes.

465. Samuel Walsh and John Henry Brierley. Colouring and graining skins of leather on one side, and japanning them on the other side.

485. John Barrow. Improvements in the manufacture of soda, sulphurous and sulphuric acids, carbonic acid, chlorine and muriatic acid, and apparatus used therein.

499. Peter Armand Lecomte de Fontainemoreau. A new cicatrising preparation. A communication.

505. Thomas Taylorson Jopling. An improved construction of water meter.

534. Ferdinand Kaselowsky. Improvements in winding yarns and threads of flax and hemp in spinning and twisting machines.

557. Samuel Last. Improvements in trunks or portmanteaus, and an improved lock for the same.

567. Auguste Neuberger. Extraction of oil from a vegetable substance not hitherto so used.

618. Phillip Marcus. An apparatus for working the damper in steam-engine furnaces. A communication.

653. Augustus Dacre Lacy. Improvements in certain apparatus for taking up and delivering mail-bags and other packages from a railway carriage or carriages whilst the train is in motion.

710. George Hedgcombe Smith. An improvement in the manufacture of saucepans, kettles, and other like culinary utensils.

739. Constant Jouffroy Duméry. Improvements in smoke-preventing apparatus.

745. Joseph Webber. Improvements in generating steam.

880. Edwin Heywood. Improvements in fixing apparatus for generating steam, whereby smoke will be prevented or consumed and fuel economised.

938. Edmund Hunt. Improvements in Hansom cabs and similar vehicles, parts of which improvements are also applicable to other carriages.

998. Thomas Hill. Improvements in steam-boilers and furnaces connected therewith.

1004. Thomas Walker. Improvements in playing cards.

1076. Louis Guillaume Perreaux. An improved valve.

1150. James Leck and Alexander Miller. Improvements in singeing textile fabrics.

1166. Richard Coleman. Improvements in implements for ploughing, hoeing, and scarifying land.

1239. Thomas Herbert and Edward Whitaker. An improvement in the manufacture of warp lace fabrics.

1252. Alphonse René le Mire de Normandy.